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FORESTRY EDUCATION IN GREAT BRITAIN.

The Departmental Committee appointed in 1902 to inquire into and report upon the condition of forestry in Great Britain, and upon the measures which could be taken for its promotion, placed in the forefront of their recommendations* the provision of systematised instruction, which should be within the reach of all classes concerned with woodlands. The present time appears opportune to notice what the Board have done to give effect to this recommendation, and the instruction which will shortly be available in this country. On the 15th March last, Lord Barnard called attention in the House of Lords to the Report of the Committee, and asked whether His Majesty's Government proposed to take any, and if so what, steps to give effect to the recommendations as regards education, instruction, and training in forestry. The following extracts from the reply by Lord Onslow indicate the action that has been taken by the Board in this direction:—

" . . . The noble Lord asks me whether His Majesty's Government intend to take any steps, and if so, what steps, to carry out the recommendations of the Departmental Committee which was appointed to enquire into this subject. Well, my Lords, Committees and Commissions are appointed for different purposes. It has been said that many Commissions are appointed with a view to shelving a question. That is not the practice of the Department over which I have the honour to preside. When the Board of Agriculture and Fisheries appoints a

* Cd. 1319, par. 13.

Departmental Committee, it is in order that it may get its advice, and having got its advice, that it may act upon it; and the Committee to which the noble Lord has called attention is no exception to the rule. I am happy to think that that Committee had the advantage of being presided over by a Member of the other House of Parliament who has always taken a very great interest in this question, and that upon this Committee was also one of the Commissioners of His Majesty's Woods and Forests, Mr. E. Stafford Howard, who also takes a very deep interest in the question of afforestation; and it is to his exertions and initiative that we owe the first steps which have already been taken in this matter.

"There are many areas of land belonging to the Crown which lend themselves to these purposes. There are the extensive Alice Holt Woods in Hampshire, which cover a large area of ground, but which I believe have not in time past been planted and worked on the most scientific principles; and although it was proposed by the Committee that the first experiment in this direction should be tried in these woods, it was found, on further consideration, that a more promising sphere of operations offered itself in the Highmeadow Woods of the Forest of Dean. Without any assistance from the Treasury—an assistance which we always welcome, but do not always receive—the Commissioners of Woods and Forests have already established a school of forestry in the Forest of Dean. That school will be primarily for the purpose of educating men of the class of woodmen. They will pass through a course of instruction there which it is believed will fit them to become foremen on the large estates of those landowners who are prepared to devote time and money to this object. . . . We fully hope that the experiment which Mr. Stafford Howard is trying in the Forest of Dean will result in training young woodmen in the same way that we are training young gardeners at Kew.

"The Department over which I have the honour to preside has no responsibility in regard to Scotland, but the Scottish Office has not been any more supine in this matter than has the Board of Agriculture and Fisheries, and I am informed that, again through the agency and assistance of the Office of Woods and Forests, communications have been entered into with

certain Scottish landowners with a view to securing a suitable area of forest land for the purpose of planting in the manner suggested by the Departmental Committee.

"We have also been successful in obtaining from the Treasury the promise of assistance in the foundation of at least two schools of forestry in England. Where those schools shall be established I am not yet able to inform your Lordships; but we have had applications from the University College of Bangor, with which my noble friend Lord Powis is intimately connected, from the South Eastern College at Wye, from the University College of Wales at Aberystwyth, from the Durham College of Science, and the Royal Agricultural College at Cirencester, and the matter is also under the consideration of the Yorkshire College at Leeds, the University College at Reading, and the University of Cambridge. With regard to the University of Cambridge, I have been considering whether that University would not be one of the first at which such a school of forestry should be established; but, as your Lordships are probably aware, a Committee has been sitting for some time past to enquire into the condition of Coopers Hill College, which up to now has existed as a school for the training of those who go out to assist in forestry in India. I am not in a position to say what may be the final decision of the Secretary of State with regard to the continued existence of Coopers Hill College, but it is, I think, a matter of common knowledge, among those interested, that in recent years suggestions have been more than once made for the removal of the Indian forestry students from Coopers Hill.

"I should like, naturally, to establish these schools in two localities, one of which would be devoted more particularly to the training of young woodmen, and the other to the training of young men who are likely either to become themselves landowners or to embrace the career of land agents; and I think that those two would be well found in a combination which should include either the school to which my noble friend Lord Barnard referred* or the University College of Bangor. Either of those would provide the requisite materials for the education of young woodmen, but I do not think they would to the same extent

* The Durham College of Science.

provide for the education of the young men who are themselves likely to become landowners. For that reason I should prefer that the second school of forestry should be attached to one of the great Universities. But that is a matter which still remains open, and until the decision of the Secretary of State for India has been arrived at as to the future of Coopers Hill College, I am not in a position to say where the second of those schools of forestry will be established. . . . ."

The Forest of Dean, with the Highmeadow Woods, will thus form a State demonstration area; and, so far as regards England, the recommendations contained in paragraphs 17–19 of the Committee's Report are carried out in their entirety. The nature of the instruction now provided at the Forest of Dean is shown in the following memorandum, which was prepared by His Majesty's Commissioners of Woods and Forests :—

"With a view to giving effect to the recommendation contained in paragraph 25 of the Report of the recent Departmental Committee on British Forestry, the Commissioner of Woods in charge of Dean Forest and the Highmeadow Woods adjoining has arranged, with the sanction of the Treasury, to start an experimental course of instruction for student-woodmen, who will be employed in these Crown woods during the time of their training.

"Mr. C. O. Hanson, of the Indian Forest Service, has been appointed Instructor, under the supervision of Mr. Philip Baylis, the Deputy Surveyor of Dean Forest.

"The classes are held in the Crown Office, Coleford, and began in the middle of January last.

"The course will be spread over two years, and will include instruction in forest botany, sylviculture, forest mensuration, and protection of woods.

"Eight young men have applied to become students, six from the Forest of Dean, where they are already employed, and two from Windsor.

"This is as many as employment can be found for at present. It is hoped that next year, when these eight will have completed the first part of the course and will go on to the second part, eight more may take up the first part in succession.

"At the end of the first two years and every year after-

wards an examination will he held, and those student-woodmen who pass satisfactorily will receive a certificate signed by the Commissioner of Woods and the Deputy Surveyor of Dean Forest."

Reference is made in the President's reply, quoted above, to the assistance promised by the Treasury towards the foundation of schools of forestry in England and Wales. This amounts to a sum of £500, which has been placed on the Estimates for 1904-5 as a grant in aid of forestry instruction. After mature consideration, and subsequently to the reply by the President in the House of Lords, the Board have come to the conclusion that this sum would be of most use if divided equally between the Agricultural Departments of the University College of North Wales, Bangor, and of the Durham College of Science, Newcastle-upon-Tyne.

The nature of the instruction which it is proposed to provide at these two centres will be gathered from the following particulars furnished to the Board by the Governing Bodies of the two Colleges named :—

The University College of North Wales proposes "to meet the recommendations of the Departmental Committee by the appointment of an expert in forestry who should :—

"(*a*) Give a course of lectures in forestry at the College to the agricultural students ;

"(*b*) Give special courses to young foresters and woodmen employed in demonstration forests in the district ;

"(*c*) Give practical professional advice in connection with woods the owners of which desire an expert's opinion."

"This scheme has been drawn up after consultation both with some of the leading landowners and agents of North Wales, who are giving it their warm support (about £50 a year having already been promised in subscriptions), and also with Mr. Stafford Howard, a Commissioner of the Woods and Forests Department, and Mr. J. Parry, the Water Engineer of the Liverpool Corporation, who is in charge of the catchment area for the Vyrnwy Waterworks. Mr. Stafford Howard said that the Commissioners of Woods and Forests would consider proposals for the purchase of suitable land in the neighbourhood for planting, and allow it to be used in connection

with the College for demonstration purposes. The same Department already possesses farms well within reach of Bangor which are partially planted.

"The Liverpool Corporation, it is understood, would allow the plantations it is carrying out at Vyrnwy to be utilised for demonstration purposes; though, having already appointed its own expert, it could not (for the present at least) put the management in the hands of the College Lecturer.

"In addition to these demonstration forests, there are in the neighbourhood of Bangor several large private plantations which the students will be permitted to visit for the purposes of observation."

The Agricultural Committee of the Durham College of Science "have come to the conclusion that educational work of this character would be of very great importance and value in the north of England, and that the College would be able to organise and develop a satisfactory scheme of education in forestry for the four counties of Northumberland, Durham, Cumberland, and Westmorland. This would include the appointment of an expert in Forestry, whose first duty would be to give lectures to the agricultural students of the College, many of whom intend to adopt the profession either of land agent or of teacher of agricultural science; he would also conduct short courses of lectures for young foresters at suitable centres, such as Alnwick, Hexham, Barnard Castle, Carlisle, &c., and on the following day conduct the members of the class to adjacent woods for demonstration purposes. In addition to forestry, he would be required to give instruction in such subjects as the planting, cultivation and layering of hedges, on the construction of other fences and of gates, on the treatment of timber in the timber yard, on methods of preserving timber, &c.

"The Committee are of opinion that, in addition to the more essentially educational functions of such an expert, his services as a practical adviser (for which a charge might be made) would be of the greatest possible value to the landowners and land agents of the district.

"The College recognises the importance of appointing an expert who has a thorough knowledge of practical forestry, as well as good scientific attainments.

"At the Northumberland County Council Farm at Cockle Park, which is under the supervision of the College, over ten acres have already been laid out as experimental plantations: two tree nurseries have been formed, and an arboretum and shelter belts have been planted. The farm, which is 400 acres in extent, is held by the County Council under a lease from the Duke of Portland, which includes a provision for the development of forestry.

"This work at Cockle Park was initiated by Dr. Somerville when he was Head of the Agricultural Department of this College. He also gave courses of instruction to young foresters at Hexham, and conducted an evening class in the College for young foresters from the counties of Durham and Northumberland. These were most successful, and indicate that classes of this character would be of great service to forestry in the north of England.

"The fact of the English Arboricultural Society having its origin in, and still a very intimate connection with, Tyneside, is a proof of the great interest taken in this subject in the district.

"The proposed scheme has the support of many landowners in the district and their agents. The representative and appropriate woodlands of the Duke of Northumberland and the Duke of Portland would be at the disposal of the College for demonstrations to students and for experimental purposes; and Lord Barnard would gladly give similar facilities on the extensive Raby Estates in South Durham. Tyneside is exceptionally well wooded, and, speaking generally, the north of England is very suitable for educational work of this character. A special advantage lies in the fact that between Tynemouth and West Cumberland all conditions of British climate are experienced, varying from the colder east coast to the milder and more humid west, while in the four counties great varieties of altitude are to be found."

Apart from the institutions aided by the Board, the Royal Agricultural College, Cirencester, has recently arranged to provide instruction in forestry, and Dr. W. Schlich, C.I.E., F.R.S., Principal Professor of Forestry at Coopers Hill, has been appointed Honorary Professor of Forestry at Cirencester.

As regards Scotland, Edinburgh University has for several

years past maintained a Lecturer on Forestry (Lieut.-Colonel F. Bailey, R.E.). Education in forestry, as in other agricultural subjects, in Scotland falls within the purview of the Scotch Education Department; but the Board understand that the Edinburgh and East of Scotland Agricultural College have appointed Mr. Fraser Story as Lecturer on Forestry; and that local classes have already been, or are being, arranged by the County Councils of Berwickshire, Fifeshire, and Perthshire. At the West of Scotland Agricultural College, also, a class in forestry has been established during the past session, under the direction of an experienced Forester. It is expected that in connection with this College, also, subsidiary courses of instruction in forestry will be organised in several of the counties which combine to support the College.

HOUSING OF POULTRY ON FARMS.

Increase of production in connection with any branch of live stock necessitates changes in method. Where one or two animals or a few fowls are kept, we can, without much risk, deal with them in a very simple manner; and, although the profit is small, if there be any at all, the work is unimportant, and will not repay much thought and labour. Under such circumstances, where a few fowls are maintained around the homestead, they may be accommodated in one of the farm buildings, permitted to wander where they will, finding a considerable portion of their food, and without much danger of disease resulting from tainted soil. But with increased numbers the primary necessity is that the fowls shall be distributed about the farm, not only to give them fresh ground—thus avoiding disease—but that their numbers shall bear a proper relationship to the acreage. With larger stock the importance of maintaining such a relationship is recognised, and we must realise that the principles underlying the management of cattle or sheep are equally applicable to poultry. Overstocking must be avoided, otherwise loss will ensue. Moreover, in extending the poultry industry our object should be to do so without displacement of other animals or of crops. Upon farms fowls are an accessory to the other branches. Experience has shown that if a farmer keeps, say, thirty hens about the homestead, he may do so profitably; but if he increases the number, without change of method, to one hundred, his returns will be proportionately lessened, and the loss from disease be vastly increased.

Within recent years the portable house system has largely come into vogue, more especially in the northern, eastern, and midland counties. By means of these houses poultry-keeping can be adapted to the regular rotation of farm crops, and the

number of fowls increased to a considerable extent, without danger to crop or pasture; whilst the manure produced is distributed without labour, and at periods of the year when it will prove of the greatest benefit to the land. These houses are only intended for fowls which are given full liberty. The capital expenditure is small, as the use of fencing is entirely avoided, and they can be moved at will. In summer it is desirable to give them the shelter of trees, or to select a position least exposed to the sunshine; in winter it is well to protect them from wind and driving rain by placing them under the lea of a copse or hedge, and where they can get as much sunshine as possible.

Houses which are intended to be moved frequently must be of a small size, to accommodate from fifteen to twenty-five birds. It has been proved by the experience of poultry-keepers, both at home and abroad, that a flock of twenty-five hens will give a higher average of returns in egg production than when they are massed together in larger numbers, even though the same care in selection be exercised in the greater as in the smaller flock. The explanation appears to be that in the latter case the birds do not get sufficient fresh air at roost. Where one hundred fowls are herded together the greater proportion must breathe air which has already been vitiated, but in a smaller house practically every inmate can obtain an abundant supply of fresh air. Hence it is more advantageous to keep down the size than might otherwise be expected, and the slightly increased capital expenditure is fully compensated by enhanced productiveness of the hens.

The simpler forms of houses or "huts," as they are called in the North of England, are wooden erections standing upon the ground, and built in sections. To move these it is necessary to take them to pieces, and, as a consequence, the ground cannot be changed frequently, or the labour becomes too heavy. Upon waste land no injury would result, but on pastures the grass within and for a few yards around the house is killed or injured, and the manure produced in the house has to be removed regularly. Where the land is arable, either the site of the house must be changed more frequently or the building must be left unoccupied for several months of each year.

With the object of facilitating regular removal, and thus preventing injury to the grass and securing fresh soil for the fowls, wheels should be added to the houses, so that the position can be easily changed with horse or hand traction. With fixed wheels the walls are thus raised six to eight inches from the ground. In such a case a wooden floor becomes necessary, for a strong draught would be created, and the birds could be attacked when at roost by their enemies. Sometimes the floor is raised sufficiently to allow space for shelter below; this has advantages, though not so great as may be thought. It is found, however, that a house with a wooden floor is colder in winter than one without. In cold weather the bank of air below the floor reduces the temperature considerably, making a demand upon the birds to counteract its influence, which has the effect of decreasing their productiveness at a time when eggs are specially valuable. At that season there is a considerable amount of heat from the earth, which is entirely lost when a wooden floor is used. Moreover, labour is required for cleaning out houses of this class. In not a few cases peat-moss litter is employed to cover the floor; but though this has the effect of making them warmer, it is objected to, on some land as it shakes out during removal, and also causes additional expense.

Whenever possible, therefore, it is better to dispense with a wooden floor, and thus to obtain the benefit of ground warmth, besides of economising labour. To secure such a result, various forms of wheels have been introduced, so that by levers the house can be raised and fixed upon the wheels for removal, and, after being shifted, dropped upon the ground again in the new position. By this method the work is simplified; under-draughts are avoided; the heat from the earth is conserved; the manure falls directly upon the ground; and the grass is uninjured. Figs. 1 and 2 represent the latest form, the former showing the house at rest and the latter when raised. The raising is accomplished by means of a powerful lever bar (A), which, when the house is on the ground, is entirely turned over and lies upon the earth by the side of the wall, so that it cannot be injured by, or hurt, cattle or horses. Attached to this lever is a strong axle, passing under the two side walls, connecting the two back wheels (B), and fixed by a

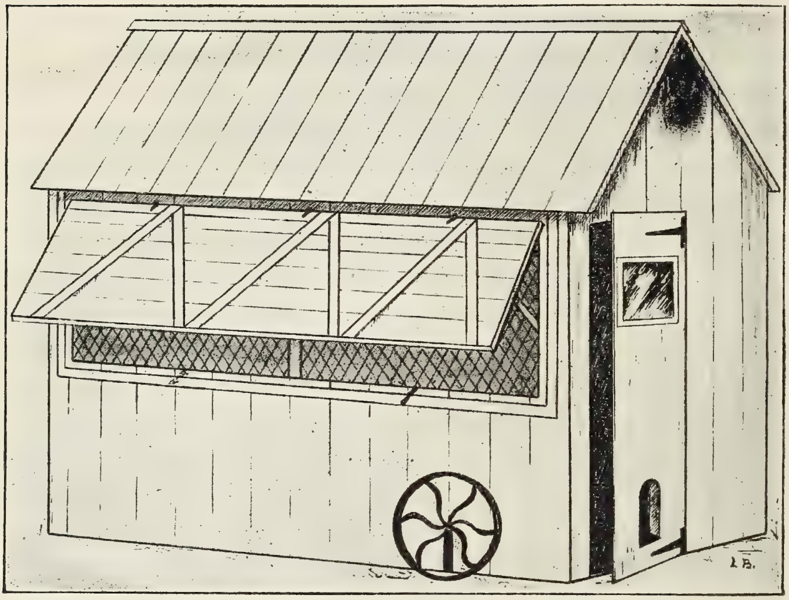

FIG. 1.—PORTABLE HOUSE AT REST.

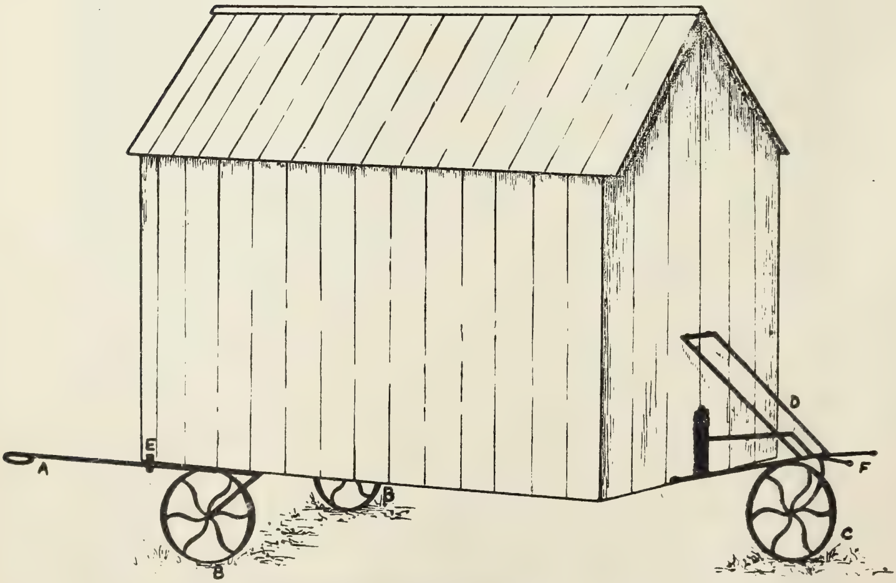

FIG. 2.—PORTABLE HOUSE, RAISED FOR REMOVAL.

rod to the front axle and wheel (C). When the house is resting the front wheel remains between the iron framework (D) by which it is protected. In operation the lever bar is raised, and by the time it has reached the upright position the wheel in front has been turned over, and that end of the house lifted up; then by pressing it down until level, the back wheels are reversed, and the entire house elevated, when it is held firmly by the clutch (E). Two strong bars in front (F), attached to the iron framework, are placed to facilitate removal. To these a horse can be yoked by means of chains, if that is desired. A strong man can move unaided the house a few yards, and a youth or girl can raise and lower it. The advantage of using three wheels rather than four is that turning is more easily accomplished.

In districts where foxes are troublesome great care must be given to the closing in of birds at night, and not allowing them out too early in the morning. Hence the labour of going round several fields may be considerable, and this must tend to limit the extent of the operations. Fig. 3 illustrates a form of house designed effectively to protect the inmates and to minimise work. Attached to this house, as part of the structure, is a run consisting of stout framework, to which is fitted at the sides, end, and top, wire netting, with a gate at one side. A couple of wheels are provided, and as the house is slightly cut away at the back, the entire structure can be removed by lifting up the run in front by means of a bar which acts as a handle. The advantage of attaching the run is that the fowls are fed in it, and readily enter at the afternoon time of feeding, when the gate is closed and they are effectively secured. It would be a decided improvement if raising wheels were fitted to this house, as the "cut away" at the back would be avoided. The fowls are still in the open air, and can go to roost just when they think fit, without needing any more attention. Furthermore, they can come out in the morning, as soon as it is daylight, and "the early bird catches the worm," without risk of attack by a fox, at a time when these marauders are most dangerous.

Breeding stock can be kept in portable houses, and they will be found to mix very seldom, provided that a male bird be placed with each group of hens. It is better, however, to keep

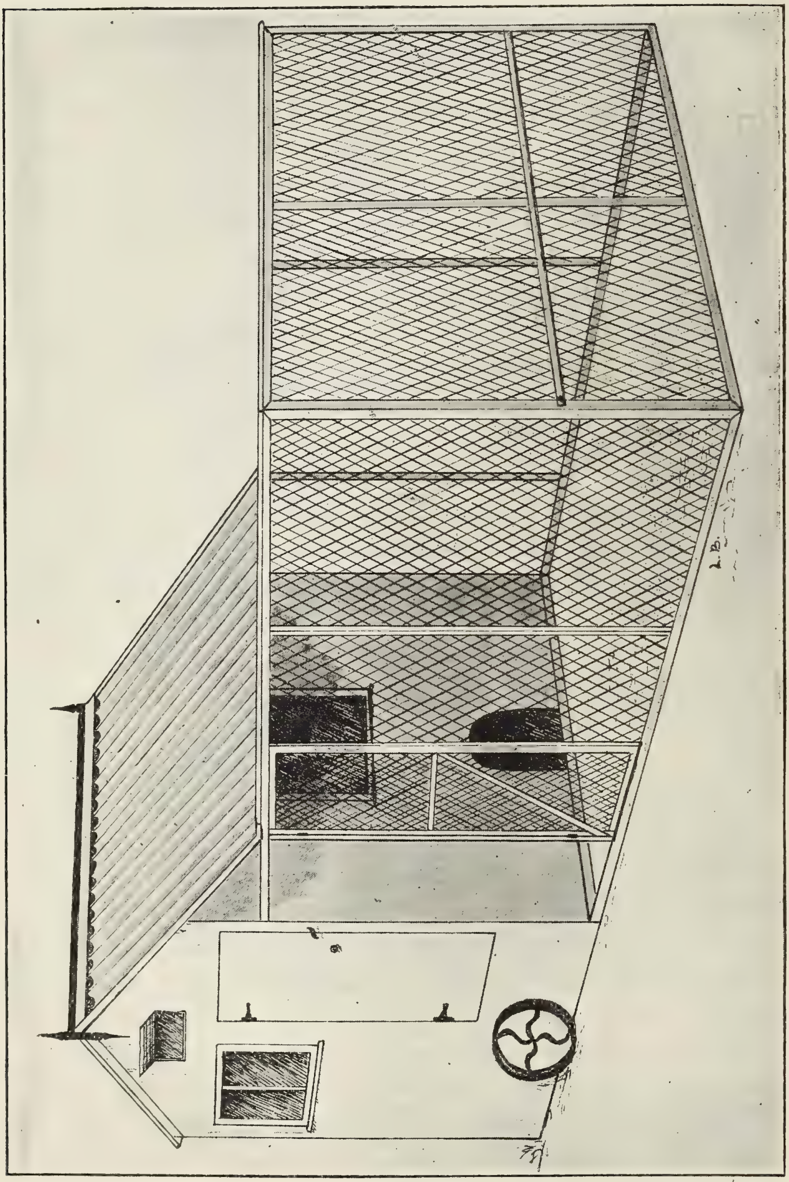

FIG. 3.—PORTABLE HOUSE WITH RUN.

them within a run attached to the house for a few days before they are set at liberty, in order that they may become properly mated.

Many attempts have been made to maintain fowls upon a limited space either as breeding stock or for egg production, but

until recently without the measure of success desired. The reason, as has already been indicated, is the impregnation of the land with manure, frequently resulting not only in reduction of productiveness, but also in loss through disease engendered by these conditions. Further, fowls in confinement can, as a rule, obtain very little in the way of exercise, and unless they are very carefully fed internal fat is induced, and they become less prolific. Moreover, fowls kept under these conditions require a greater amount of protection against unfavourable weather, as they are unable to find the natural shelter available to birds in the open. The building which has to a considerable extent met these difficulties is known under the term "scratching shed." In such places besides the roosting place, a covered yard or run is to be found, which is usually littered with straw or cut chaff. Corn is thrown into this yard, and the fowls are compelled to work for their food, just as they do under more natural conditions. There can be no question that where poultry are kept in confinement such a method is most desirable. But the system needs to be carried out completely, and it entails a much greater capital expenditure than where portable houses are employed. On the other hand, more can be accomplished within limited areas.

In Fig. 4 is shown one form of fowl-house with a scratching shed. This is divided into two sections by a partition boarded up to 6 ft. with wire netting above; first, the roosting place (shown with a window in the illustration); and, second, the scratching shed. For twenty-five fowls the following are the dimensions recommended: Length, 18 ft.; depth, 10 ft.; height, 8 ft. at front, and 6 ft. at back; divided into roosting compartment, 8 ft. by 10 ft., scratching shed, 10 ft. by 10 ft. For a dozen fowls: Length, 12 ft.; depth, 6 ft.; height, 7½ ft. at front, 6 ft. at back; divided into roosting compartment, 5 ft. by 6 ft., scratching shed, 7 ft. by 6 ft. Another form is: Length, 9 ft.; depth, 10 ft.; height, 8 ft. at front, 6 ft. at back; divided into three portions, roosting compartment, 6 ft. by 4 ft.; laying compartment, 3 ft. by 4 ft.; scratching compartment, 9 ft. by 6 ft. This is suitable for ten or a dozen fowls, and the separate laying compartment is of great advantage, as the laying of individual hens can be registered if the entrance is fitted with

trap wires. The roosting and laying compartments are at the back, and the scratching shed in front.

Roosting compartments in scratching shed houses are bedded out with earth or peat-moss litter, but the scratching sheds should have a thick bed of gravel or sand, well beaten down and levelled. During very unfavourable weather the fowls can be kept entirely under cover. In North America oiled muslin curtains are fitted to frames, which are hung up against the roof when not in use, and suspended in front during snow

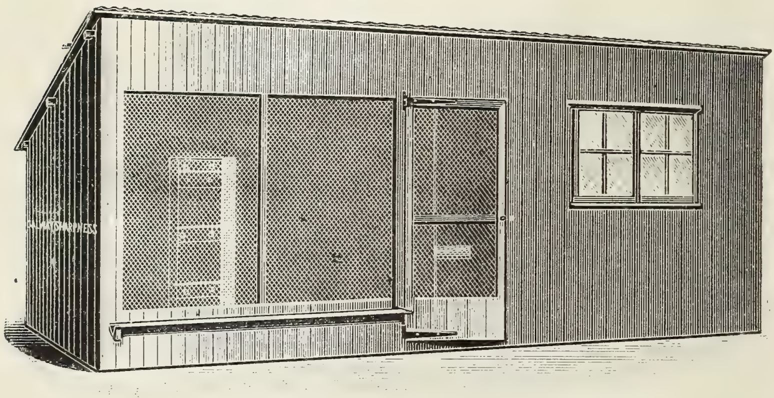

FIG. 4.—ROOSTING PLACE WITH SCRATCHING SHED.

storms, but such an arrangement is seldom necessary in this country. In front of the house is an open yard, 20 ft. long, and as many feet wide as the house is long, that is, 18 ft., 12 ft., or 9 ft. respectively. It is entirely enclosed, and if there is a range of houses the fences should be boarded up 2 ft. The ground in the run is covered with gravel or ashes or sand, the first named preferred, and it is swept out daily to remove all manure. Beyond this is a grass run, which may be used by two or three of the houses in common, allowing each lot of fowls access to it in rotation. The stretch of grass should be 100 ft. in length, and 36 ft. in width for two of the larger or three of the second-sized houses, while 27 ft. is sufficient for the third size. Under such arrangements it will be found that the bulk of manure produced will fall in the house or open yard, whence it can be removed, and that the grass in outer runs can be kept in good heart, even though

a couple of hundred fowls be maintained to the acre. But it is desirable to allow the grass runs to rest once in every two or three years and crop them for hay.

Principles of Housing.—The following principles may be laid down as applicable to all forms of poultry houses :—

Size : For fowls and ducks, in sleeping compartment, 2 square ft. of floor space ; for geese, 6 square ft. ; for turkeys, 12 square ft.

Materials : Wood should be well seasoned, and be $\frac{7}{8}$ in. or 1 in. in thickness, and the house must be well put together. The roof must be more substantial than the walls ; if of wood, it should be covered with tar felting ; but the best roof is made with corrugated iron lined with $\frac{3}{8}$ in. match-boarding. For permanent structures, such as scratching sheds, felting may with advantage be placed between the corrugated iron and match-boarding.

Ventilation : Fresh air is a necessity. In Fig. 1 is shown a shutter, behind which is wire netting. The shutter may be left half open during the greater part of the year. The scratching sheds are usually well ventilated. In portable houses which have no shutter, louvre boards are placed in the gables at either end.

Light : A large window placed in the south or south-east side will make the house warmer in winter and keep the air sweet. Dark roosting places are objectionable.

Perches : These should be all on the same level, not more than 2 ft. above the ground, and facing the windows. They ought to be easily moved.

Nest Boxes : These, if made loose, will be more easily kept clean, and ought to be on the dark side of the house. One nest box is required for every three hens.

Cleanliness is most important. Houses should be swept down regularly, and limewashed inside three or four times a year.

EDWARD BROWN, F.L.S.

BELGIAN DEPARTMENT OF AGRICULTURE.

The Belgian Department of Agriculture has recently issued, in connection with the International Exhibition of St. Louis, a publication containing some interesting particulars respecting the Organisation of the Department, together with some account of the Staff of State Agriculturists in Belgium.

The Department of Agriculture, of Industry and Public Works was instituted by a Royal Decree in 1884, by which all matters relative to agriculture, industry, bridges, roads, &c., were detached from the Department of the Interior and transferred to the new Department. Subsequent Decrees have somewhat modified the matters which it controls, and at the present time the Department is divided into three sections in addition to the Secretariat. The first division has charge of all necessary measures relating to the improvement of domestic animals, the veterinary service, sanitary police laws, &c.; the second division deals with agricultural instruction, the State Botanic Garden, and the Service of State Agriculturists; while the third division embraces matters relating to Agricultural Associations, Agricultural Statistics, the Chemical and Bacteriological Institute and the Analytical Laboratories. It also has charge of the work connected with the Agricultural Insignia, and publishes the *Bulletin de l'Agriculture,* which is the official journal of the Department.

The administration of forestry is dealt with by a bureau having a central administration in Brussels and provincial branches. It is charged with the preservation and management of the forests belonging to the State, Communes and public establishments, and arranges for prosecutions in cases of injury to forests. The improvement of waste lands, which are still extensive in Belgium, is also carried out by the Bureau of forestry. It also superintends fishing in the canals and rivers, the services of inland and sea fisheries and the execution of measures destined to favour the increase of fresh and salt water

fish ; and also all matters concerning forests, waste lands, fishing and shooting.

A special branch is charged with the organisation of experimental fields on rational and uniform lines, and with the collection of statistics of research work carried out in Belgium and other countries. The inspector who has to see that these researches and experiments are duly carried out, is also always at the disposal of any persons wishing to consult him on the treatment of forests or the improvement of waste lands.

The Department is assisted by Boards dealing with agriculture, with forestry and with public health ; and by committees on sea fisheries, pisciculture and oyster fisheries.

Work in the provinces is carried out by Veterinary Inspectors, Agricultural Inspectors, State Agriculturists (Agricultural Engineers), Inspectors and general keepers of rivers and forests, and by dairy Experts.

The agricultural section of the State Commercial Museum the Analytical Laboratories, and the Bacteriological and Chemical Institute at Gembloux, with its Dairy Station, are also under the control of the Department.

The service of State Agriculturists forms an important part of the work of the Department by enabling it to keep directly in touch with, and to afford practical assistance to, farmers in Belgium. It was instituted in 1885, and only holders of a diploma of Agricultural Engineer are eligible.

The principal duties of the State Agriculturists are :—

(*a*) To popularise the facts of agricultural science, by written or oral consultations, lectures, experiment fields and demonstrations ; to put themselves in direct communication with farmers, and give them free advice ; and to fulfil the functions of technical advisers and agricultural lecturers.

(*b*) To teach farmers the advantages of co-operation, and to give precise information on the organisation and operations of these agricultural associations.

(*c*) To inform the Central Administration as to the work done by these agricultural societies, and to advise as to the financial assistance to be afforded.

(*d*) To organise and direct courses of agricultural lectures for adults, travelling agricultural Schools of Domestic Economy,

courses of Horticulture, Arboriculture, and Market gardening, etc., instituted by the Department of Agriculture.

The staff of State Agriculturists numbers twenty-three, who have to send to the Central Administration reports relating to their lectures, the state of crops and experiment fields, the associations of farmers, and as to markets and shows, agricultural implements, rural industries, and on the sanitary condition of Cattle. The Agricultural Inspectors superintend the service of State Agriculturists, and the Central Administration is able to follow the work done by the latter by the general journey table annexed to their annual report.

The honorary functions of a "Correspondent of the Administration of Agriculture" are fulfilled by specialists who give the State Agriculturists precise information on various subjects.

Advice to farmers is published in the form of leaflets. The State Agriculturists distribute these leaflets, when they give their lectures or through their correspondents, or through the professors of public courses.

Experiment and Demonstration Fields are also arranged under their supervision. They are established on land easily accessible to the public and representing the average conditions of a widely extended zone. The experiment fields are established, as far as possible, on plots of land belonging to intelligent farmers who possess good implements, close to the places in which courses of lectures for adults are given, and to establishments in which courses in agriculture are provided. In this way they are a useful adjunct to the theoretical instruction. Whatever land is chosen, the soil must be uniform, and not close to tree plantations, enclosures, or buildings; and the whole plot chosen must have been submitted to the same rotation and had the same application of manures. The experimenter must prepare and keep the soil in good cultivation and condition, and supply the necessary farm manure. The crops belong to him, but the State Agriculturist may take samples for experimental purposes. Seeds, roots, and chemical manures are provided by the Department of Agriculture, and the results obtained are published in the *Bulletin de l'Agriculture.*

BREEDING OF LIVE STOCK IN BELGIUM.

The publication of the Belgian Department of Agriculture referred to above contains some particulars respecting the assistance afforded directly or indirectly by the Department to horse and cattle breeding in Belgium.

In regard to horse breeding, it is observed that the provinces of Belgium have for a long time possessed regulations relative to the improvement of the native draught horse, some of which date as far back as the eighteenth century. Attempts were first made about 1840 to establish in the provinces a scheme of regulations, the main principles of which have varied very little. Under the influence of the *Sociétés d'Elevage*, this system has, however, gradually become more uniform, and in 1901 all the provincial councils of the country, without exception, adopted a scheme of regulations drawn up by the Minister of Agriculture with the aid of the *Comité Supérieur Hippique.*

The provincial regulations have a double aim: (1) to eliminate from breeding the stallions which do not possess the qualities desired to improve the breed to which they belong; and (2) to encourage, by means of money bounties, the preservation of the animals, both male and female, of native breed.

In the months of October and November each year an examination is made of all the stallions of native breed intended for service in the course of the year. For this purpose each province is divided into a certain number of districts, which the committees of examination visit. It is owing to this selection of the breeding sires, which had been in operation for several years earlier in some provinces, that Belgium is possessed of a breed of high-class draught horses.

The committees are formed of five members, of whom four

are elected by the permanent deputation of the provincial council, the fifth is selected by the Minister of Agriculture.

Since 1902 the Minister has also appointed, in accordance with the provincial regulations and the recommendation of the Belgian Jockey Club, a committee of examination, composed of three members and a veterinary surgeon, who are charged with the examination of animals intended for public breeding purposes. In the month of February this committee visits the residences of owners of thoroughbred stallions.

A committee, elected by the Minister of Agriculture, on the recommendation of the *Société Royale Hippique de Belgique* acts under the same conditions for the examination of half-bred stallions and of thoroughbred stallions which habitually serve half-bred mares. This is the scheme adopted for the examination of stallions of all breeds. The examination is valid for one year.

Neither the Government nor the provinces grant financial assistance for the breeding of the thoroughbred horses. The *Société Royale Hippique de Belgique* receives from the State an annual subsidy of 10,000 francs (£400) for the purpose of encouraging the breeding of half-breeds. The Belgian Jockey Club and the *Société Royale Hippique* publish stud-books of the breeds which they desire to encourage.

The encouragement afforded by the provincial regulations relative to the improvement of horses affects exclusively the breeding of the native horse (Belgian draught horse). The cost of the execution of these regulations, money bounties and committee expenses, are borne to the amount of 40 per cent. by the provinces and of 60 per cent. by the State. The total annual expenses amount to about £14,000. These expenses serve to meet the cost of the shows of foals, fillies, mares, and brood-mares which are fixed by the provincial regulations. In the forty-four places of meeting, all the examinations of stallions are immediately followed by a show of stallions three years old, and a show of stallions four years old and over.

In each of these shows, there may be awarded to the owners : (*a*) for the two best stallions a first prize of 400 francs (£16) and a second of 300 francs (£12) ; and (*b*) for the two best stallions four years old and over, a first prize of 550 francs (£22)

and a second of 400 francs (£16). There may be awarded further extra prizes for stallions of three years, and four years and over, according to each group of five stallions approved of by the committee, in each of these two classes.

In order to retain in the country the stallions passed as the best by the committees of examination, there may be awarded a maintenance bounty of 700 francs (£28) to the owner of every stallion to which has been awarded, at at least one previous annual show, a first competition prize in the class of stallions of not less than four years old. This prize is increased by £4 for stallions to which a provincial prize has been awarded. A maintenance prize of £20 may also be given to the owner of the stallion to which has been awarded, during two years, a second competition prize, in the class of stallions of four years and over.

When the committees of examination consider a stallion to which a maintenance prize has been awarded to be of exceptional value, they can nominate it to compete for a bounty of £240 payable by five annual instalments so long as the horse remains approved by the committee of examination, and retains its value. In the event of a stallion, to which a bounty of £240 has been awarded, being sold out of the country, the instalments already paid must in every case be returned to the Department, either by the present owner, or by the original possessor. At the end of the five years, the owner of a stallion which has obtained a bounty of £240, if it remains approved, can continue to enjoy an annual maintenance prize, the amount of which may vary from £24 to £32.

Finally, there is arranged in each province an annual provincial competition for the stallions which have obtained a prize in the class of four years and over, or a second prize in one of the shows of the year or of the preceding year; there are two prizes of £36 and £28.

The examination of stallions is followed, sometimes in the same year, but generally in the succeeding year, by shows of foals and of fillies of two and three years, and by shows of brood mares. Considerable prizes are awarded at these different shows. Maintenance bounties may also be awarded to the owners of the best brood mares.

By these means the provincial regulations encourage the maintenance of good breeding stock from the age of eighteen months, and encouragement is continued during a long period if the condition of the horses justify it. As regards stallions of merit, the maintenance bounties are paid to the owners so long as the committees pass the horses as fit for service.

In 1886 the Belgian Draught Horse Society was established, with the object of encouraging the breed by shows, and by keeping a stud-book. An annual subsidy of £1,200 is now granted to the Society.

In addition the Government have offered since 1890 premiums for the best stallions. These rewards number eighteen, and amount to £60 each; they are awarded in four district shows to the three year old stallions which have gained a first prize at the provincial shows.

The Belgian Government encouraged by grants the importation of the Shorthorn breeds of cattle by the provincial authorities. These animals were bought in England by a Committee appointed for the purpose, and were publicly sold in Belgium. The difference between the cost price and the sale price was paid one half by the State and the other half by the provinces.

The want of judgment, however, shown by farmers in using the English bull, the bad choice of the animals purchased in England, the difficulty of crossing Belgian breeds with the Shorthorn, and the difference in the living conditions and feeding of the two races, were the principal reasons for the poor results obtained by the infusion of English blood, and Belgian farmers have consequently given up breeding Shorthorns.

A great many Dutch cattle are imported into Belgium, as a number of farmers find it advantageous to buy certain classes of these Dutch animals rather than to breed them at home.

Regulations are in force in all the provinces for cattle breeding similar to those relative to the improvement of horses. The examination of bulls intended for service is prescribed, and prizes are awarded to encourage the preservation of the best animals, both male and female.

These regulations encourage the keeping of first-class male and female animals, and are a means of preserving the bulls capable of maintaining the stock. The cost of providing the money prizes is borne in certain cases entirely by the Government; in others the Government bears up to 75 per cent. of the expenses. The total annual cost amounts to about £8,000 for the State and £6,000 for the provinces. Since 1896 several breeding syndicates and herd-book societies have been formed in Belgium, having as their principal object the improvement of breeds by selection.

All these efforts are evidence of the strong desire to improve the native cattle, but it will take some time before the beneficial effects of these attempts will be felt. It is nevertheless undeniable that in certain parts of the country great progress has been obtained by the operations of these provincial regulations and breeding syndicates.

The Government encourages the syndicates and the federations of syndicates by grants for first establishment, and by grants for the keeping of stud-books of the breeding stock. A few syndicates have been formed with the object of buying breeding bulls.

The National Society for the Improvement of Cattle in Belgium was instituted in 1899. This Society held several shows in April 1900, 1902, and 1904, which were very successful, and contributed in a large measure to spread amongst the rural populations the ideas of uniform and definite races. This Society also published an album showing the types of the different Belgian races. The Government encourages this association by granting important subsidies in aid of the biennial shows.

In 1899 the Government instituted a Commission for the improvement of the breeds of pigs in Belgium. This Commission set to work immediately, and tried to show the advantages of increasing the Yorkshire breed, yielding bacon of excellent quality. They held several shows, open to all Belgian breeders, which have greatly contributed to the promotion of pig breeding in Belgium.

INSURANCE OF LIVE STOCK IN BAVARIA.

The Board have received through the Foreign Office a copy of a memorandum prepared by Mr. L. Buchmann, H.M. Consul at Munich, upon the insurance of cattle and horses in Bavaria.

Mr. Buchmann states that there are four kinds of cattle insurance in Bavaria: (1) government insurance (Law of May 11, 1896), (2) private insurance companies, (3) local insurance associations, and (4) municipal insurance of cattle for slaughter (in some of the larger towns only).

1. *Government Insurance.*—The German Imperial Law of June 23, 1880, amended by that of May 1, 1894, concerning the suppression and prevention of diseases in cattle, provides for the payment of compensation in certain circumstances to owners of animals which are slaughtered by order of the police, but only on condition that the regulations have been previously carried out by the owner. The State, however, does not compensate in the case of loss through ordinary illness or accident.

The first attempts at cattle insurance in Germany date from as far back as 1799, when in Holstein, and somewhat later in Hanover, the so-called "Cow Guilds" were founded. These were local associations involving the joint responsibility of the several members. Parochial and municipal associations, founded subsequently, were not able to cope with heavy losses, and the aid of Government was called in. After Baden, Belgium, Alsace-Lorraine and Switzerland had shown the way, Bavaria followed in 1896.

In 1892, there were 3,337,978 head of cattle in Bavaria, having a saleable value about £33,000,000, or on an average £10 per head. It was ascertained that nearly half of the total number of cattle in Bavaria belonged to the smaller farmers, *i.e.* those possessing not more than 25 acres of arable

land. These small farmers form about 80 per cent. of the whole agricultural population of Bavaria; consequently, the loss of a single animal is keenly felt. It is true that the State helps in case of epidemics, and special laws have been enacted with this object: *e.g.*, the pleuro-pneumonia and glanders law of 1881; the anthrax law of 1892; and the rinderpest law of 1896.

2. *Private Cattle Insurance Companies.*—In 1896 there were nine large private cattle insurance companies in Bavaria, insuring over 10,000 horses, or 2·8 per cent. of the total number, and 3,644 head of cattle, or 0·11 per cent. of the total; the whole insured for £905,800. The high premiums charged by these private companies were the cause of the small percentage of cattle, being insured. In 1902 only 0·15 per cent., *viz.*, 5,118 head of cattle, were thus insured, for a total sum of £76,387.

3. *Local Insurance Associations.*—On the other hand, local insurance associations have been far more successful. These are affiliated to a State Cattle Insurance Department, which has been in existence since November 1, 1896, and conform to its regulations. In the year 1896, 355 such local insurance associations were enrolled. In 1902–03, there were 2,304 cattle insurance associations of all kinds, with 119,805 members.

The State Insurance Department pays annually a sum of £5,000, besides a special grant of £1,250 in order to assist the local associations, which only work at a loss, in paying the premiums. The State Department insures only cattle and goats, and undertakes to make good half of the losses, the other half being paid by those local insurance associations in whose districts the losses occur. Each cattle-owner must insure the whole of his cattle, single animals not being admitted. The animals must be over three years, and less than twelve years old, when first insured. Professional cattle-dealers are not admitted as members of the associations. Inspections take place in spring and in autumn. Cattle may not be insured in several associations simultaneously. In case of war, revolution, fire, lightning, bad feeding, or ill-treatment, the insurance is void.

The rates of compensation are, in the event of death from natural causes and obligatory slaughter: seven-tenths and eight-tenths of the value in the case of cattle, and 15 shillings

for goats. Compensation is also paid if after slaughter it is discovered that the meat is unfit for human food on account of tuberculosis, &c.; in this case the owner receives eight-tenths of the value of those parts of the meat which are declared unfit for food. This latter compensation is in fact an insurance against the meat being ultimately found unfit for food after having been first passed by the sanitary inspectors as sound.

Since November 1, 1900, there exists in Bavaria also a State insurance department for horses alone (Law of April 15, 1900). The principles followed are the same as those for cattle insurance: local associations form the basis and they pay half of the compensation, the other half being paid by the Department. The horses to be insured must be over eight months and under fifteen years of age. The compensation amounts to seven-tenths of the value. In 1902-3 there were 401 local associations for the insurance of horses in Bavaria, numbering 24,366 members, 60,021 horses being insured for the sum of £1,271,632.

In many places, the insurance systems above described meet with some opposition, on the ground that the small farmers are called upon to contribute towards the compensation granted to the owners of large numbers of cattle.

4. *Municipal Insurance of Cattle for slaughter.*—The municipal insurance of cattle for slaughter was instituted in Munich on June 1, 1903. The premium is 11d. for cattle and a little over 1d. for sheep, swine, &c. The first six months yielded a surplus of £500, which was used to form a reserve-fund. Other Bavarian towns (Nuremberg, Bamberg, &c.) have also started this special kind of insurance with similar results. The idea is to compensate cattle-owners whose animals have been found sound by the sanitary inspector, in the event of the meat, or portions of it, being subsequently discovered to be unfit for human food.

PREPARATION OF ALCOHOL FROM POTATOES IN GERMANY.

The Board have received through the Foreign Office the following particulars, prepared by Dr. Rose, H.M. Consul at Stuttgart, concerning the manufacture of alcohol from potatoes :—

Alcohol from potatoes was manufactured in Germany during the eighteenth century, but it was only during the nineteenth that the industry attained any importance for agriculture. Its progress has been latterly most rapid, and it was greatly accelerated by the intensive cultivation of potatoes, which has been brought about by the spread of scientific agricultural instruction.

The foundations of this agricultural instruction were laid by Liebig. In his "Chemical Letters," issued in 1859, he showed that soils are comparatively poor in salts of potassium and how much is taken from them by cultivation ; for example, a crop of one acre of potatoes takes 90 lb. of potassium salts from the soil. He showed further how insufficient the manures then used (wood-ash, beet, and wool refuse) were to replace this loss, and advocated the application of mineral manures. The result of his investigations was the commencement of the working of the Stassfurt and Anhalt salt strata.

The following figures show the increase in the productivity of the soil of the German Empire as regards potatoes : The average yield was, in 1879–88, 32·8 cwt. per acre ; in 1888–96, 36·2 cwt. ; and in 1899, 49·8 cwt.

During the eighteenth century alcohol was principally derived from grain, and the centres of its preparation were fairly evenly distributed throughout Germany. During the nineteenth century it was almost exclusively prepared from

potatoes, and the production was confined to the eastern district. The west of Germany buys potatoes for food, both of man and beast; the east of Germany, less thickly populated, produces a surplus, and sells part of this to the west, the principal amount of the surplus being, however, converted into alcohol, although it is also used for making starch. In some districts 50 per cent. of the potato harvest is devoted to the preparation of alcohol. Roughly speaking, about 4 per cent. of the total cultivated area of the empire is under potatoes. The amount grown on the different holdings and the distribution of these holdings vary, of course, greatly; the proportions range from 0·5 per cent. to 85 per cent., and about three-fourths of the whole German production of alcohol is produced in the country east of the Elbe.

In 1831, 492,000 tons of potatoes and 6,400,000 bushels of grain were converted into alcohol, yielding about 26,400,000 gallons of alcohol. These figures remained stationary until about 1855. By 1885 the production had risen to about 88,000,000 gallons, of which about a quarter was exported. This is the period when Liebig's discoveries were disseminated. This amount fell to 60,500,000 gallons in 1889 owing to foreign competition, the loss of several foreign markets, and internal taxation. This last difficulty was overcome by new fiscal regulations, placing heavy duties on alcohol for consumption and reducing the duties on alcohol for technical purposes. The consumption of alcohol for technical purposes consequently rose from almost nothing in 1860 to nearly 22,000,000 gallons in 1898. The total production of alcohol in 1898 was 72,600,000 gallons.

The manufacture of alcohol from potatoes is mainly an agricultural industry, that is to say, the greater part of the spirit is made in distilleries situated on the farms; there are only a few industrial distilleries situated in towns.

Of the total amount produced in 1898, 49,720,000 gallons were consumed in Germany (about 9·2 gallons per head of population), 19,800,000 gallons were used for industrial purposes, and only 836,000 gallons were exported. The total amount was derived principally from 2,260,000 tons of potatoes which yielded about 57,200,000 gallons.

The arrangement of the distilleries, whether for potatoes or grain, consists in almost all cases of a conical steamer. In this the raw material is submitted to the action of compressed steam in order to convert the starchy meal into a pulp. It is then treated in the first mash-tun, which must be well cooled and provided with an effective stirring apparatus. Here malt is added and sugar is formed. The acid process is not much used in Germany, as it renders the residue worthless as food for cattle. "Langmalz" (long or strong malt), mostly prepared from barley, is generally used. The next step is fermentation in large vats containing 440 to 1,100 gallons. Pure culture yeast is generally used for fermentation. The alcohol formed by fermentation is obtained from the mash by distilling. This distilling process in Germany is generally a continuous one with the aid of a "column apparatus"; the old stills are almost completely abandoned. The raw spirit thus obtained is rectified in special refineries. By the use of Ilge's apparatus a good spirit can be obtained directly from the mash.

The residue from the whole process is much used as a food for cattle, and is, perhaps, as valuable as the spirit itself.

Alcohol is beginning to be used in Germany for motor purposes, and small motors up to 25 h.p. are already at work. It is, of course, difficult to say to what exact extent they have already been adopted, as this would require careful and numerous inquiries in many directions. There is no doubt that the French are ahead of the Germans with regard to the application of alcohol to motive purposes. A large exhibition was held at the beginning of the year at Paris, where many machines for driving with alcohol were shewn by different firms.

UNITED STATES FOOD STANDARDS.

The Agricultural Appropriations Act, passed by the United States Senate on the 25th February last, contains provision for the examination at the ports of entry of any imported food suspected to contain substances injurious to health, or which are falsely labelled or branded.

By an Act approved on March 3rd, 1903, the Government appointed a committee to collaborate with the Secretary of Agriculture to establish standards of purity for food products, and to determine what are regarded as adulterations. As a result of this inquiry the Secretary of Agriculture, in Circular No. 10, dated 20th November, 1903, proclaimed certain standards for various products, and also laid down definitions of these substances. The following relate to agricultural products of most interest to farmers or consumers in this country :—

Meat is defined any sound, dressed, and properly prepared edible part of animals in good health at the time of slaughter. The term "animals" includes not only mammals, but fish, fowl, crustaceans, molluscs, and all other animals used as food. *Fresh meat* is meat from animals recently slaughtered or preserved only by refrigeration. *Salted, pickled* and *smoked meats* are unmixed meats preserved by salt, sugar, vinegar, spices, or smoke, singly or in combination, whether in bulk or in packages. *Manufactured meats* are meats not included in the above, whether simple or mixed, whole or comminuted, in bulk or packages, with or without the addition of salt, sugar, vinegar, spices, smoke, oils, or rendered fat.

Lard is the rendered fresh fat from slaughtered healthy hogs, *Leaf lard* is the lard rendered at moderately high temperatures from the internal fat of the abdomen of the hog, excluding that adherent to the intestines. *Standard lard*, and *standard leaf lard*, are lard and leaf lard respectively, free from rancidity containing not more than 1 per cent. of substances, other than fatty acids, not fat, necessarily incorporated therewith in the process of rendering, and standard leaf lard has an iodine number not greater than 60. *Neutral lard* is lard rendered at low temperatures.

Milk (*whole milk*) is the lacteal secretion obtained by the complete milking of one or more healthy cows, properly fed and kept, excluding that obtained within fifteen days before and five days after calving. *Standard milk* is milk containing not less than 12 per cent. of total solids, and not less than 8·5 per cent. of solids not fat, nor less than 3·25 per cent. of milk fat.

Blended milk is milk modified in its composition so as to have a definite and stated percentage of one or more of its constituents.

Skim milk is milk from which a part or all of the cream has been removed. *Standard skim milk* is skim milk containing not less than 9·25 per cent. of milk solids.

Buttermilk is the product that remains when butter is removed from milk or cream in the process of churning.

Pasteurized milk is standard milk that has been heated below boiling, but sufficiently to kill most of the active organisms present, and immediately cooled to 50° Fahr., or lower, to retard the development of their spores.

Sterilized milk is standard milk that has been heated at the temperature of boiling water or higher for a length of time sufficient to kill all organisms present.

Condensed milk is milk from which a considerable portion of water has been evaporated. *Sweetened condensed milk* is milk from which a considerable portion of water has been evaporated and to which sugar (sucrose) has been added. *Standard condensed milk* and *standard sweetened condensed milk* are condensed milk and sweetened condensed milk, respectively, containing not less than 28 per cent. of milk solids, of which not less than one-fourth is milk fat.

Condensed skim milk is skim milk from which a considerable portion of water has been evaporated.

Milk fat or *butter fat* is the fat of milk. *Standard milk fat* or *butter fat* has a Reichert-Meissl number not less than 24, and a specific gravity not less than 0·905 (40° C./40° C.).

Cream is that portion of milk, rich in butter fat, which rises to the surface of milk on standing, or is separated from it by centrifugal force. *Standard cream* is cream containing not less than 18 per cent. of milk fat. *Evaporated cream* is cream from which a considerable portion of water has been evaporated.

Butter is the product obtained by gathering in any manner the fat of fresh or ripened milk or cream into a mass, which also contains a small portion of the other milk constituents, with or without salt. By Acts of Congress, approved August 2nd, 1886, and May 9th, 1902, butter may also contain additional colouring matter. *Standard butter* is butter containing not less than 82·5 per cent. of butter fat.

Renovated or *process butter* is the product obtained by melting butter and reworking, without the addition or use of chemicals

or any substances except milk, cream, or salt. *Standard renovated* or *process butter* is renovated or process butter containing not more than 16 per cent. of water, and at least 82·5 per cent. of butter fat.

Cheese is the solid and ripened product obtained by coagulating the casein of milk by means of rennet or acids, with or without the addition of ripening ferments and seasoning. By Act of Congress, approved June 6th, 1896, cheese may also contain additional colouring matter. *Whole milk* or *full cream cheese* is cheese made from milk from which no portion of the fat has been removed. *Skim milk cheese* is cheese made from milk from which any portion of the fat has been removed. *Cream cheese* is cheese made from milk and cream, or milk containing not less than 6 per cent. of fat. *Standard whole milk cheese* or *full cream cheese* is whole milk or full-cream cheese, containing in the water-free substance not less than 50 per cent. of butter fat.

Whey is the product remaining after the removal of fat and casein from milk in the process of cheese making.

Aphides or Plant-Lice.*

Nearly all plants, in garden and field, and under glass, suffer from the ravages of Aphides. These universal pests are most common in temperate climates, but even in the tropics whole crops are ruined by them. The Aphis enemies of many crop and ornamental plants are very numerous in species. The Aphides themselves are known by a great variety of names, such as Green and Black Fly, Smotherers, and Dolphins, while the disease they produce is sometimes termed "Blight."

They belong to a group of insects called Hemiptera, which are provided with a mouth used for sucking and capable of piercing the structures of plants, upon the sap of which they feed. They undergo what is termed an incomplete metamorphosis, that is, there is no quiescent chrysalis (pupal) stage, and they feed throughout their whole existence.

* The following species of Aphis are dealt with separately, viz.: Woolly Aphis (Leaflet 34), Currant Aphides (Leaflet 68), and Hop Aphis (Leaflet 88).

They damage plants in a twofold manner, first by sucking out the sap and so weakening the vitality of the plant, and secondly by stopping the respiration of the plant by blocking up the stomata (or breathing pores) of the leaves with their excreta. This excreta is not only of the ordinary kind, but also consists of a sweet gummy substance that stops the "breathing" of the plant, and is called "honey-dew." This substance is passed out through two tubes, called "cornicles," situated on the back of the Aphides. A few Aphides, such as the Woolly Aphis (Leaflet No. 34), have no cornicles and produce no honey-dew. The skin of the plant-lice is provided with numerous glands which secrete either a waxy substance that covers the skin (Rose Aphis, Bean Aphis, &c.) or dense woolly masses (Beech Aphis, Woolly Aphis, &c.). In both cases the excreted substances have the power of throwing off water and so of keeping the insects dry.

Life History.

Aphides may be winged or they may be wingless; as a rule winged and wingless generations occur in each species.

The reproduction in Aphides is very rapid. They not only breed in the ordinary way, but they can also breed without any males being present. Some Aphides live only on one kind of plant, the Rose Aphis (*Siphonophora rosæ*) for instance; others live on two plants, migrating from one to the other, as the Hop Aphis (*Phorodon humuli*) which migrates between the hops and the prunes (*vide* Leaflet No. 88); others live on several plants, as the Bean Aphis (*Aphis rumicis*), which may be found on Beans, Peas, Docks, and Furze.

Some kinds, as the Rose Aphis, attack leafage and shoots alike; others, as the Bean Aphis, may even attack the fruit (pods); others the stem and twigs (Woolly Aphis). Not only do plant-lice migrate from plant to plant, but some can live both above and below ground, and may migrate from root to trunk or root to foliage (as the Phylloxera of the Vine and the Woolly Aphis of the Apple).

The typical life-history of the Aphis is as follows:—The adult female or "Mother Queen" is wingless, and produces, without the agency of a male, not eggs, but living young; these

young are called "lice," and in a short time they resemble the wingless parent, and can themselves produce living young. This viviparous reproduction, where only females are present, can go on for many generations. Should a plant be covered with these Aphides, their food becomes scarce, and then they have the power of producing winged females, which fly off to other plants, and these deposit living young. Towards the end of the year most Aphides produce males as well as females; these may be either winged or wingless. These females, after being fertilised, deposit eggs at the base of buds and on the stems, leaves, &c., of plants. These eggs remain over winter, and hatch into the larvæ that become the "Mother Queens" with which this account of the life-history started. Some plant-lice live entirely during the winter in the egg state (Bean, Pea, Plum Aphis, &c.), others mostly as insects, a few eggs only occurring (Woolly Aphis).

The effect of weather on Aphides is very great. Dry, hot and sultry weather is favourable to them; the same conditions check the growth of the plant, and so the plant-lice soon overcome it. An excessive quantity of manure, especially nitrogenous manure, also predisposes the plant to Aphis attack.

Remedies.

Aphides can easily be destroyed by spraying the affected plants with a soft soap wash. This is made by dissolving from 6 to 10 lb. of soft soap in 100 gallons of soft water. The soft soap blocks up the breathing pores of the plant-lice, and so kills them. Quassia is sometimes added; this acts as an astringent to the leafage, and cleans it of the honey-dew and excreta formed by the Aphides. For black-fly on Cherry, and for all those that produce a copious flow of honey-dew, it is a most useful ingredient. The quassia chips are boiled and the extract added to the soft soap wash; 6 to 8 lb. of chips are required to every 100 gallons of wash. Paraffin emulsion is necessary for some kinds, as Woolly Aphis, which may also be attacked in winter by caustic alkali wash (Leaflet No. 70). For those which attack the root it is best to use bisulphide of carbon injected into the soil, a quarter of an ounce to every four square yards. Care must be taken with this substance,

which is both poisonous and inflammable. The vapour of bisulphide of carbon liquid, used in the bee-keepers' "smoker," is said to be a very good remedy for green fly, and does not injure the most delicate flowers.

In all cases the Aphides must be attacked as soon as an invasion shows itself, especially when the species of Aphis has the habit, like the Plum Aphis, of curling up the leaves and so of protecting itself.

Natural Checks.

Several insects prey upon Aphides, and should be encouraged. The chief of these are Ladybirds and their larvæ (*Coccinellidæ*); Hover-fly maggots, which are the larvæ of the *Syrphidæ*; the larvæ of the Lace-wing or Golden-eye flies; and various minute hymenopterous parasites (*Chalcididæ*), which lay their eggs in the bodies of the Aphides, and whose maggots destroy them.

Man cannot, however, rely solely on the services of these beneficial creatures, but must check the increase of the Aphides by washes as soon as they appear upon his cultivated plants.

The Indian Wheat Crop.

The second general memorandum of the season 1903-4, issued on the 5th March, indicated a considerable addition in the acreage under wheat in India. Compared with last year, the percentages of increase are about 6 in Bengal, 8 in the North-West Frontier, 11 in the Punjab, 20 in the Central Provinces, 104 in Berar, 69 in Hyderabad, 9 in the Bombay Presidency (43 in Sind alone), and probably 10 in the United Provinces.

As regards the yield, the reports from the United Provinces were the least favourable,—75 to 90 per cent. of the average,—with the possibility of deterioration from rust. The Bengal report was good, and indicated 94 per cent. of the normal. The anxiety regarding the prospects of the crop in the Punjab and the North-West Frontier was allayed by the rain which fell early in March over the whole of North-Western and Central India. The crop in the Central Provinces suffered somewhat

from want of rain, and 107 per cent. is the revised estimate in lieu of the anticipated bumper crop. The injury from the same cause reduced the Berar estimate to 90 per cent. The out-turn in Hyderabad is expected to be 87 per cent. as compared with 85 per cent. last year, and a fairly good yield is anticipated in Sind and Bombay, except in parts of North Gujarat and the East Deccan, where moisture was deficient, and the Karnatak, where the crop suffered from rust.

Experiments in Sowing of Barley and Oats.

The Yorkshire College have continued their investigations at Garforth with a view to testing the best amount of seed to sow in the case of barley and oats; and the results of the 1903 experiments are given in Nos. 38 and 39 of their reports. Barley was sown on plots at the rate of 5, 3, and 2 bushels per acre; and the resultant yields were, of saleable grain, $34\frac{3}{4}$, 35, and $35\frac{1}{2}$ bushels per acre respectively, while the total yields were 39, 39, and $38\frac{1}{4}$ bushels. In 1902 there was also little difference between the plots; and it is concluded that from $2\frac{1}{2}$ to 3 bushels is a sufficient quantity of seed, both for yield and quality of sample.

The quantities of oats sown were 5 and 4 bushels per acre; two varieties (Storm King and Tartar King) being used. Here the extra bushel of seed was followed by $3\frac{3}{4}$ bushels more of saleable corn with Storm King and $5\frac{1}{2}$ bushels more with Tartar King. With Tartar King there was a much higher proportion of seconds corn with the smaller sowing, so that the total crop of grain was the higher in their case. The total yields were:—Storm King (5 bushels), $58\frac{3}{4}$ bushels per acre; Storm King (4 bushels), $56\frac{1}{4}$ bushels per acre; Tartar King (5 bushels), $60\frac{1}{4}$ bushels per acre; and Tartar King (4 bushels), $65\frac{1}{4}$ bushels per acre. The results thus indicate that with large-grained oats an extra bushel of seed is followed by about 3 to 4 bushels more of saleable corn.

Report No. 39 of the Yorkshire College, Leeds, contains a note on experiments carried out in 1903, in continuation of previous trials, to determine the effect of a dressing of 5 cwt. per acre of salt on the barley crop.* The trial in 1902 failed owing to the crops being badly "laid," but 1901 (a very dry season) and 1903 (an extremely wet year) showed in both cases an increase of 6 to 8 bushels of saleable corn, and also an increase in total corn from the use of salt; while there were $8\frac{3}{4}$ cwt. of straw more in 1901 and $1\frac{1}{2}$ cwt more in 1903 on the plots receiving a dressing of salt. On a medium loam or light soil, therefore, a dressing of 5 cwt. of salt may be expected to prove profitable. The grain was also submitted to an expert, who reported that, for malting purposes, the barley from the plot dressed with salt was the best of all the samples submitted.

Experiments with Salt for Barley.

A paper of considerable importance, from the botanical and chemical point of view, on "Varieties of Barley," by Mr. E. S. Beaven, is contained in the *Journal of the Federated Institutes of Brewing*, Vol. VIII., No. 5. After classifying the different varieties of barley known, Mr. Beaven records the results of experiments undertaken with a view of ascertaining the characteristics as malting material of some well-known varieties grown under different conditions. These experiments, Mr. Beaven states, are only preliminary, and not sufficiently advanced to allow of reliable conclusions being drawn as regards farm practice.

Varieties of Barley.

The experiments in rearing calves, conducted in 1901 by the Irish Department of Agriculture, were repeated in 1902, but with a slight modification suggested by the previous year's experience, one lot being given a calf meal composed of one part ground flax seed, two parts oatmeal and two parts Indian meal, instead of Indian meal only, with separated milk. The

Calf Rearing Experiments.

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* *Journal*, Vol. IX., June 1902, p. 70.

calves were again divided into four lots, which thus received :— Lot 1, whole milk ; Lot 2, five parts separated milk and one part whole milk ; Lot 3, separated milk and cod liver oil ; Lot 4, separated milk and the calf meal described above. The composition of the ration given to Lot 2 approximates fairly to that of hand-skimmed milk. Each lot also received an allowance of linseed cake.

The experiments, begun in May, 1902, were carried out in the grounds of the Cork Exhibition, which offered exceptional opportunities for a public demonstration. The previous year's trials were conducted in county Sligo, where the calf mortality was less than in many districts ; the 1902 experiments were thus at a certain disadvantage in this respect, and duplicate calves had to be substituted in cases of sickness. These are not, however, thought to have any effect upon the conclusions drawn.

At the end of the first twenty weeks the calves reared in the Cork Exhibition had all made considerably larger increases than those reared during the corresponding period of 1901. This is ascribed to the effect of the housing, this being the only condition which differed materially in 1902 ; still, the Department do not, upon one season's trial, recommend the system of summer housing calves.

After the weaning period, the calves were all placed on uniform rations, and treated alike. The following rations were fed throughout the winter, until May, 1903 :—1 lb. linseed cake and 1 lb. crushed oats per head per day, with meadow and rye grass hay *ad lib.*, and a feed of straw once or twice a week. From May to October, 1903, the cattle were out at grass. Towards the end of this latter period the grazing became somewhat bare, and cotton cake was fed ; nevertheless they were only in thin condition when sold, at the end of October, at 23s. 10d. per cwt. live weight.

Taking into account the prices realised and the cost of the food, it appeared that the greater gain made by the calves fed on whole milk—the most expensive of the rations—did not compensate the increased cost of feeding, and the calves which gave the best results were those fed on separated milk and cod liver oil.

Considering the results of both years' trials, the Department

of Agriculture concludes (i) although calves fed for a long period on whole milk will show a high rate of increase when compared with the gain in weight made by animals reared on other foods, the increase is not proportional to the cost incurred; and that (ii) it is more economical to use a cream substitute, such as linseed cake with cod liver oil, Indian meal, or a mixture of meals, along with separated milk, than to use whole milk and linseed cake.

It should be noted that the cod liver oil in 1901 cost 4s. 6d. per gallon and 5s. 6d. in 1902, and that its use is no longer profitable if the price is too high.*

British Cattle for the Transvaal.

The Board are informed that the Government of the Transvaal has no intention of importing breeding cattle in any quantity at the present time. It is possible that small numbers of pure bred animals may be purchased for the purpose of improving the existing stock of the Colony, but it is not anticipated that more than that will be done. A great many breeding cattle were imported in order to re-stock the Colony after the war, but it is now considered that as much has been done as would be justifiable at present, and that any further importations of breeding cattle may well be left to private enterprise.

Farm Animals in the United States.

The *Crop Reporter* for February last gives the number of farm animals in the United States on 1st January, 1904, as follows:—Horses, 16,736,059; mules, 2,757,916; milch cows, 17,419,817; other cattle, 43,629,498; sheep, 51,630,144; and swine, 47,009,367.

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* *Journal of the Department of Agriculture and Technical Instruction for Ireland*, Vol. IV., No. 3, March 1904.

Epizootic Lymphangitis Order.

The Board have issued an Order, to come into force on the 18th April, providing for the isolation of horses affected with epizootic lymphangitis. Suspected cases of this disease must be reported to the police, who must notify the Local Authority, and all horses affected with, or suspected of, this disease are to be kept separate from others. If the Local Authority is satisfied of the existence of epizootic lymphangitis, the horses must be isolated on some specified premises from which they may not be moved, they may not come into contact with other horses, and their litter, dung, &c., may not be removed without permission from the inspector of the Local Authority. The place where the horses have been kept must subsequently be cleansed and disinfected as directed in the Order; and carcases must be buried in their skin with quicklime or other disinfectant, or burned.

A short account of the symptoms of this disease was given in the last number of the *Journal*, Vol. X., March, 1904, p. 521.

Danish Tuberculosis Law.

The Board have received information through the Foreign Office that the Danish Law relating to tuberculosis in cattle has been slightly amended. By the old law no milk or butter-milk could be taken from a dairy and used as food for domestic animals which had not previously been warmed up to a temperature of at least 85 degrees Centigrade (185 degrees Fahrenheit). By the new law the temperature is reduced to 80 degrees Centigrade (176 degrees Fahrenheit) and the regulation is extended to all cream from which butter for export is churned.

A new regulation is introduced, dealing with the isolation of animals undergoing the test for tuberculosis.

The old law is described in detail in Vol. V. of this *Journal*, pp. 74-75 (1898, June), and another reference is made in Vol. VI., p. 234 (1899, Sept.).

The Transport of Irish Butter.

The recently published Report of the Irish Department of Agriculture for the year 1902–3 contains some useful information regarding the condition in which Irish butter is placed on the English market, and the facilities which are provided by the carrying companies for its conveyance.

It is stated that a steady improvement has taken place in the construction of the boxes used, and that consignors are more careful than formerly in seeing that the packages present a clean appearance. In many cases, however, exporters do not realise the advantages that accrue from the employment of strongly constructed and neatly finished boxes, and from the adequate protection of consignments from rain and from the heat of the sun. The use of unseasoned wood in the manufacture of boxes is one of the factors which have injured the Irish butter industry, and an inferior description of parchment paper is not infrequently used as a wrapper for the butter. When enclosed in such packages it is liable to become tainted and to lose its colour. Beneficial results have, however, already followed the official representations which have been made to consignors, and it is admitted by several extensive dealers in Irish butter that a marked improvement has taken place—boxes of a substantial character are now more frequently employed, canvas covers are more extensively used, and the butter itself is more carefully packed.

The treatment of consignments of produce during their transfer to steamers at the Irish ports has received special attention. A definite improvement has, it appears, taken place in the methods of handling, and comparatively few cases of carelessness in the transfer of the packages have come under notice. Some instances have, however, occurred of butter being placed in close proximity to foul-smelling articles while awaiting shipment, and in all such cases representations were made to the companies concerned. A few of the vessels engaged in this traffic possess refrigerating plant, and, in other instances, ice in tubs is used in the ships' compartments; but in the large majority of cases no such means have been adopted for keeping the holds of the vessels at a suitable temperature.

The Report contains the results of enquiries made early in

1903 regarding the methods employed in the packing of foreign butter intended for the British market, and the facilities for the conveyance of this produce to its destination. Two inspectors were afforded an opportunity of observing the arrangements for the carriage of butter from the Continent to one of the principal northern English ports, and of witnessing the actual unloading of the produce. One steamer, which carried a large quantity of Danish butter, was fitted with refrigerating apparatus, and the butter, which was stowed in compartments at 40° Fahr., was packed in every instance in clean white casks. The care exercised in handling the produce discharged from the ships was a very noticeable feature. At Liverpool and Manchester the inspectors were enabled to institute a comparison between the receptacles used respectively for the conveyance of Irish and foreign butter. The foreign casks and boxes examined were constructed of well-seasoned white wood, and had a neat and inviting appearance. The absence of this neatness in the case of many packages of Irish butter gave foreign produce a considerable advantage in commanding a ready sale in the markets. Merchants in Manchester who were consulted on this matter concurred in the view that the uncleanly state of many packages of Irish butter on arrival at their destination largely contributed towards a reduction in the price of the article.

Insurance of Poultry.

The insurance of live stock against accidental death, &c., is now a common feature among co-operative associations upon the Continent, although it has not yet made much progress in this country. Of late years, however, the Utility Poultry Club has adopted a scheme for insuring the poultry and the appliances of members of the club, of which the following are the main features :—

The risks covered by this form of insurance embrace losses

by fire, theft, burglary, storms, floods, seizure by foxes, and accidental death. The rates are inclusive of all kinds of stock (fowls, ducks, geese, turkeys, pheasants, partridges), and also all the plant necessary for poultry keeping (bins, brooders, coops, incubators, fattening sheds, machines, &c.). The poultry must be in enclosed runs, or reasonable care taken to guard against loss by theft or foxes.

The rates of premium charged to members of the club are £3 per cent. if the total value does not exceed £500, 2½ per cent. if the value does not exceed £800, and 2 per cent. for higher sums. Stock may be insured without plant, but in this case an additional rate of 25 per cent. of the premium is charged. Chicks under six weeks old can only be insured as part of the plant. The insurance covers fresh additions to the stock made from time to time in substitution of those disposed of.

No bird will be considered as worth more than £1, unless specified.

The Utility Poultry Club, in order to place this enterprise upon a sound commercial basis, have made arrangements with a firm of underwriters of Lloyds' for the payment of compensation in case of losses from the causes enumerated above.

Invention for Packing of Eggs.

The Board have received through the Foreign Office a translation of a notice issued by the Commercial Intelligence Branch of the Norwegian Department of Trade, Shipping, and Industry, in which it is stated that Mr. Alb. L. Barstad, of Stavanger, has the intention in the near future of placing on the market a new patented packing for eggs, called the "Ideal."

This packing consists of thin cardboard in which oval depressions, each taking one egg, have been impressed.

By turning every other sheet half round a completely self-supporting tier of cells is formed. Each tier can contain 750 eggs (25 trays of 30 eggs).

The weight of the upper trays of eggs is borne by the card-board sheets and distributed by them alone. Thus absolutely no weight rests on the eggs, not even on those of the lower trays. The eggs are surrounded by elastic walls and have only a few millimetres play, a plan which ensures a maximum of safety during transport. The eggs cannot fall out of their hollows, and the protection is the same even if the whole case is turned round or placed on its side.

This system of packing allows of the quickest arrangement as the place for each egg is ready and the elasticity protects the eggs from blows. Mistakes in counting are impossible, since each tray holds the same number of eggs. They can be rapidly unpacked, as eggs and trays can be removed as they are.

Breakage is avoided ; all handling and touching of the eggs is unnecessary. The less the eggs are touched the longer they keep fresh.

Warehousing takes up a minimum of space, as the trays can be built up to a great height without danger to the eggs. The trays are cheap and made to stow away inside each other, and are thus easy to return when empty.

Cider-making Investigations.

The Board of Agriculture have lately published a Report* prepared by Mr. F. J. Lloyd, F.C.S., F.I.C., on the results obtained in the investigations on the manufacture of cider, which have been carried out since 1893 under the direction of the Bath and West and Southern Counties' Society. The work was conducted at the Home Farm of Mr. Neville-Grenville, who kindly furnished the necessary accommodation, and to whom those interested in the development of the cider industry are much indebted.

The experiments have aroused much interest in the west and south-west of England, and the volume in question was issued in

* [Cd. 1868.] Price 8*d*.

order to place the results before a larger public. The ten years of pioneer work covered by the Report have strikingly revealed the possibilities of further improvements in English cider and other orchard products, and have led to the formation of the National Fruit and Cider Institute, which has now started work with a large measure of local support, and with the hearty co-operation of many public bodies.

In an introduction to the Report it is mentioned that there are two varieties of cider, viz., sweet cider, in which fermentation has proceeded only to a slight extent, and much of the natural sugar of the juice is left in the liquid; and dry cider, in which fermentation has proceeded so far that but little of the original sugar remains.

Mr. Lloyd's experiments indicate that the successful manufacture of good cider depends upon three factors: (1) the composition of the apples and the juice obtained from them; (2) the methods of manipulation and apparatus employed in making the cider; and (3) the fermentation which takes place in the juice.

The Report deals very fully with the various subjects connected with cider making, and the author is of opinion that by careful attention to the information which is given, the kind of cider which the public desire can be made. Mr. Lloyd makes the following observations on this subject:—

"The great want of cider drinkers, especially of those who are taking it under medical advice, is a 'dry' cider. Some would appear to desire an 'extra dry' cider. This can be obtained by paying a higher price for it than they seem willing to do at present. If consumers would recognise this and be willing to pay a fair price for the skill required in its production, there are many cider manufacturers who could, and would, make it.

"Some cider merchants say that the majority of cider drinkers want sweet cider. This being comparatively easy to produce, is therefore likely to remain the chief product of cider makers. But other merchants state that the growing demand is for a dry cider"—and this is also Mr. Lloyd's opinion—"hence, it seems certain that the introduction of good dry cider would well repay any maker who would put it upon the market. By careful

attention to the information contained in this Report, such dry cider can be made, though necessarily with more trouble than is requisite for the production of a sweeter liquid.

"In the future three brands of cider ought to be made, viz., 'A,' extra dry, that is containing not more than 2 per cent. of sugar; 'B,' dry, containing under 4 per cent. sugar; and 'C,' sweet, containing over 4 per cent. sugar. But it is worth bearing in mind, that 5 per cent. of sugar represents one ounce of solid sugar in every pint of cider, and those who like 'sweet' cider should realise this fact. It may account for much of the evil effects sometimes attributed to cider drinking. There is this advantage about dry cider. It contains more alcohol and less sugar than ordinary cider, and is, therefore, far less liable to 'go wrong.' The alcohol acts as a natural preservative, and the small proportion of sugar renders other changes improbable. The great difficulty is to prevent 'acetification,' and this can only be done by keeping the cider so that the air cannot gain access to it.

"Landlords and tenants in cider-making counties should combine to develop the capabilities of this industry, and strive to retain for English agriculturists at least one source of income which the foreigner has not yet taken from them."

Planting of Fruit Trees in Heavy Land.

The *Deuts. Land. Presse* of March 30 calls attention to the very favourable results that have attended the planting of fruit trees on a system that is somewhat novel. On good soil, where the conditions of growth are satisfactory, it is not considered necessary to adopt the system, but on poor, heavy soil it is said to furnish results very superior to those yielded under ordinary practice. A hole 3 feet deep and of the same width is first prepared, and, as the soil is filled in, it is interstratified by several layers of hedge brushings, or small brushwood. When within about 9 inches of the top the tree is planted in the usual way. The benefits of the

system are said to be due to the aeration that it secures to the soil. It would be interesting to have the method put to the test in this country.

Apple Leaf Miner.

The Apple Leaf Miner (*Lyonetia clerckella*) was very abundant in 1903. It seldom occurs on large trees, but usually on trees from eight to fifteen years old, and on low-growing trees. The damage caused is due to the larvæ, which make long sinuous tunnels in the leaves; this, when they are abundant, causes the leaves to shrivel up. Hand-picking the leaves is all that can be done, as the larvæ only feed inside the leaves. They spin small silken cocoons on the under surface of the leaves, which can easily be seen on small trees, and these should be collected and burnt. No wash is likely to affect them, and nothing can be done to prevent egg-laying.

Forestry Legislation in Sweden.

The Foreign Office recently issued a series of Reports upon the forestry laws in force in Austria, Belgium, France, Germany, Russia, Sweden and Norway, and the United States.* Since then the Foreign Office have received, and forwarded to the Board of Agriculture and Fisheries, a despatch from H.M. Minister at Stockholm, containing further particulars regarding forestry legislation enacted in 1903 in Sweden.

With the view of maintaining forests in the vicinity of shifting sands, trees on the verge of the limit of vegetation may not be cut down, as otherwise land where growth is possible when protected might be rendered barren by the encroachments of such sand, &c. In such districts, accordingly, timber may only be felled with the sanction of the local inspectors.

Forestry Boards are established in each district, their functions

[* Cd. 1805.] Price 4d.

being to improve forests by the diffusion of information and knowledge, by rendering assistance, and by supplying seeds, &c.; also to exercise supervision and ensure the due observance of the laws. The funds for the maintenance of these Boards are provided from Customs duties collected upon the exportation of timber.

The rates of export duty will be as follows:—Round, hewn, sawn or planed timber, and staves, $1\frac{1}{3}$d. per cubic metre (or $\frac{2}{3}$d. if split or corded, for fuel).

Wood pulp, dry, chemically prepared, $6\frac{2}{3}$d. per ton; mechanically prepared, 4d. per ton. Wet wood pulp, half these rates.

These duties will come into force on 1st January, 1905.

Rats in France.

The Departments of Charente, Charente-Inferieure, Vendée, Deux Sèvres, Vienne, Cher, Marne and Calvados, have suffered severely from a plague of rats, voles and field mice, while the loss to the whole country from this cause has been estimated at 200 million francs (£8,000,000) per annum. Local efforts having proved insufficient, the French Government instituted a series of experiments, with the aid of the Pasteur Institute, and have now succeeded in making a poison, known by the name of the discoverer, Dr. Danysz, which, it is claimed, is fatal to rats and voles, but not injurious to mankind or domestic animals. The cost of application is estimated at 4 francs 50 centimes per hectare (about 1s. 6d. per acre) exclusive of labour, which is expected to cost about 5 to 7 francs per hectare (1s. 8d. to 2s. 3d. per acre) more, according to the local rate of pay. With the object of encouraging the use of this method of destroying the pest, the French Government have voted the sum of 350,000 francs (£14,000), which is calculated to be a third of the amount necessary for treating the infested districts.

Agriculture in Bavaria.

The Board are informed by the Foreign Office that the Bavarian Ministry of the Interior have recently issued an account of the administrative measures taken between 1897 and 1903 in that country to further the interests of agriculture. Among other information it is stated that in 1898 inquiries were instituted concerning the profits on farms, with the result that the average interest yielded in Bavaria proper amounted to 1·9 per cent., while in the Bavarian Palatinate it was only 1·5 per cent.

The Government makes large grants in aid of agriculture, the total now approximating to £300,000 per annum, in addition to which special grants have from time to time been made, besides loans partly bearing no interest and partly at 3 per cent. It is estimated that the total outlay including loans in aid of agricultural interests during the years 1896 to 1903 amounted to £2,377,000.

Rubber Seed Cake.

Of late years considerable areas have been planted with the Para rubber (*Hevea brasiliensis*) in the tropics, and especially in the Federated Malay States. No use has, however, been found for the seeds, and a consignment of these is being investigated by the Imperial Institute with a view to the possible commercial utilisation of what has hitherto been a waste-product. These seeds contain a large quantity of oil, and it appears possible that it could be used as a substitute for linseed oil. The Imperial Institute also received a sample of about seven pounds of finely ground meal prepared from the seeds. This was subjected to examination to ascertain if it could be used as a food for cattle. It is said that animals readily eat the kernels in the Straits Settlements. The meal, as sent from the Straits, was found to be unsuitable for this purpose, owing to the presence of large quantities of free fatty acids ; but it is thought that if the oil were expressed from the

decorticated seeds, the residual cake could be utilised as a feeding material. The sample sent contained the whole of the oil in a decomposed state. It was calculated that the proteids would after extraction of the oil be about 10 per cent. lower than in linseed and cottonseed cakes (new process), but only about 2 per cent. less than in linseed cake (old process); there would be less fat, but more carbohydrates, and also less fibre. The nutrient value was thus estimated as nearly identical with that of cottonseed cake (new process). The investigations will be continued.*

Practical Schools of Agriculture in France.

By an Act of 19th January last the French Practical Schools of Agriculture, which occupy an intermediate position between the Farm Schools and the National Agricultural Schools, are to be brought more under the direct control of the State. Such schools may in future only be established on land belonging to or leased to the State; the hygienic conditions of the locality must be satisfactory; the soil must correspond to the average conditions of the neighbourhood; and the plans must be approved by the Ministry of Agriculture. The farm must be managed so as to serve as an example for the neighbourhood, and experimental plots should also be maintained.

New Gallery at Kew Gardens.

Some considerable rearrangements have recently been made in the Museums at the Royal Botanic Gardens, Kew. A new gallery, 130 ft. long by 16 ft. wide, at the back of Museum No. III., was opened on February 1st. To this the entire collection of gymnosperms (conifers, cycads, and *Gnetaceae*) has been transferred. The space thus set free in Museum No. I. has been utilised in making a more effective display of its

* *Bulletin of the Imperial Institute*, No. 4, p. 156, Vol. II., No. 1, p. 22.

contents, which had become very crowded. The well-lighted wall space in the new gallery has enabled the collection of maps and plans of the establishment at various periods to be brought together. Several of these were contributed by H.M. the late Queen and by H.M.'s Office of Works, and are of considerable historic interest. A set of the fine photographs of Kew in its various aspects, which were sent by the Government to the Paris Exhibition of 1900, is also shown, as well as an extensive series of photographs of coniferous trees in their native countries.

Commercial Agents Abroad.

The Board of Trade Journal for 3rd March last gives a list of officers, commercial attachés, and commercial agents in the Colonies and in foreign countries designated to undertake the duties of receiving and answering commercial enquiries which may be addressed to them either by the Board of Trade or by merchants and British traders who may seek advice. It is suggested, however, that British manufacturers and traders should apply to the Commercial Intelligence Branch of the Board of Trade, 50, Parliament Street, London, S.W., for any special information relating to trade in the Colonies or in foreign countries which they may desire ; and if the Branch is not already in possession of the required information steps will at once be taken to forward the questions to the proper quarter.

Wenlock Farmers' Club Records.

The Wenlock Farmers' Club, which was founded in 1842, and is therefore among the oldest of the Farmers' Clubs in the country, has published a summary of its records in the form of a pamphlet. The discussions which were held monthly in the earlier years of the association generally dealt with questions

of practical agriculture, and concluded with a resolution in the following way :—

" 1842, July.—The best mode of harvesting wheat, brought forward by Mr. Richard Davis. Resolved, that mowing expedites and economises the expense of harvest, but that reaping and hackling best preserves the quality of the grain."

"1845, December.—Subject: The best mode of preserving potatoes. The frightful disease among the potatoes caused this meeting to be looked forward to with more than ordinary interest. Resolved, that every exertion should be made to keep the potatoes dry, and as much as possible separate from each other. It was also recommended that a portion of the potatoes should be planted in autumn."

Discussions on the relations between Landlord and Tenant took place in 1845, 1846, 1848, 1849, 1873, 1879, 1884, 1895, on Agricultural Statistics, in 1855 and 1856, on Agricultural Weights and Measures, in 1849, 1857, 1882, 1883.

In 1897, there were various references to the introduction of cattle disease from abroad, the incidence of local taxation, the malt tax, and the prosperity or depression of agriculture owing to climatic disturbances.

Prizes have been offered by the Society on many occasions.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of March, 1904.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	England.		Scotland.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 6	6 10	34 10	32 6
Herefords	7 4	6 10	—	—
Shorthorns	7 4	6 9	33 10	31 6
Devons	7 6	6 11	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	s. d.	s. d.	s. d.	s. d.
Veal Calves	0 9	0 8	0 8	0 6½
Sheep :—				
Downs	0 8¾	0 8	0 8½	0 8
Longwools	0 8¼	0 7¼	0 8½	0 7
Cheviots	0 8¾	0 8	0 8¾	0 8
Blackfaced	0 8½	0 7¾	0 8½	0 7½
Cross-breds	0 8½	0 7¾	0 8¾	0 8
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	5 7	5 3	5 11	5 2
Porkers	6 1	5 9	6 6	5 10
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
In Milk	20 0	17 5	19 2	15 15
Calvers	20 0	16 14	20 1	16 1
Calves for Rearing	1 19	1 11	2 4	1 12
Store Cattle :—				
Shorthorns—Yearlings ...	8 4	6 17	10 14	8 5
,, Two-year-olds	12 8	10 14	14 1	11 11
,, Three-year-olds	15 0	12 15	—	—
Store Sheep :—				
Downs or Longwools—	s. d.	s. d.	s. d.	s. d.
Shearlings ...	42 0	37 0	33 6	32 0
Scotch Half-breds ,, ...	34 0	27 0	33 0	28 0
Store Pigs :—				
Under 3 months	18 6	14 6	26 0	16 0
Over 3 months	35 0	28 0	31 0	21 0

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of March, 1904.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	51 4	49 0	49 0	46 8	53 8*	49 0*
	2nd	47 10	44 4	44 4	42 0	—	44 4*
Cow and Bull ...	1st	—	42 0	42 0	39 8	42 0	39 8
	2nd	—	34 5	37 4	32 8	28 0	32 8
U.S.A. and Canadian :—							
Birkenhead killed	1st	47 10	47 3	46 8	44 4	46 8	42 0
	2nd	43 2	43 9	39 8	42 0	—	39 8
Argentine Frozen Hind Quarters ...	1st	26 10	28 10	32 8	30 4	30 4	30 4
American Chilled Hind Quarters ...	1st	50 2	49 3	49 0	46 8	51 4	49 0
VEAL :—							
British	1st	74 8	69 5	74 8	74 8	70 0	—
	2nd	66 6	53 1	58 4	65 4	65 4	—
MUTTON :—							
Scotch	1st	66 6	—	72 4	74 8	72 4	67 8
	2nd	61 10	—	65 4	65 4	56 0	53 8
English	1st	63 0	65 11	70 0	70 0	—	—
	2nd	58 4	54 3	63 0	60 8	—	—
Argêntine Frozen ...	1st	37 4	36 2	35 0	35 0	37 4	37 4
LAMB :—							
British	1st	107 4	97 5	112 0	—	—	—
	2nd	85 2	84 0	—	—	—	—
New Zealand ...	1st	54 10	56 0	56 0	56 0	58 4	56 0
	2nd	49 0	—	51 4	51 4	51 4	—
Australian	1st	44 4	41 8	42 0	44 4	46 8	—
	2nd	39 8	—	—	39 8	—	—
PORK :—							
British	1st	47 10	53 8	56 0	56 0	51 4	49 0
	2nd	42 0	44 4	46 8	39 8	42 0	39 8

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each of the under-mentioned Weeks in 1904, and in the corresponding Weeks in 1903 and 1902.

Weeks ended (*in* 1904).	Wheat.			Barley.			Oats.		
	1902.	1903.	1904.	1902.	1903.	1904.	1902.	1903.	1904.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 2 ...	27 7	25 0	26 3	26 7	23 11	22 1	19 10	16 10	15 5
,, 9 ...	27 8	24 11	26 6	26 7	24 1	22 6	20 0	17 0	15 7
,, 16 ...	27 8	24 11	26 11	26 11	24 1	22 3	20 0	16 10	15 9
,, 23 ...	27 7	25 0	27 3	26 7	24 1	22 4	20 3	16 11	15 11
,, 30 ...	27 4	25 4	26 11	26 7	24 3	22 3	20 2	17 0	15 8
Feb. 6 ...	27 2	25 6	26 9	26 9	23 9	22 4	20 3	16 11	15 11
,, 13 ...	26 11	25 6	26 8	27 5	23 7	22 2	20 3	17 1	15 9
,, 20 ...	27 1	25 4	26 11	26 11	23 4	22 7	20 4	17 1	16 0
,, 27 ...	27 1	25 3	27 10	26 8	23 2	22 4	20 5	17 1	16 3
Mar. 5 ...	27 0	25 3	28 8	26 8	23 1	22 6	20 5	17 1	16 5
,, 12 ...	27 1	25 1	29 1	26 6	22 10	22 5	20 6	17 0	16 8
,, 19 ...	27 1	25 1	28 6	26 4	22 9	22 9	20 6	16 10	16 7
,, 26 ...	27 2	25 2	28 2	27 2	22 4	22 8	20 7	17 0	16 7
Apl. 2 ...	27 3	25 3	27 11	26 5	22 6	22 10	20 6	17 0	16 6
,, 9 ...	27 5	25 4	27 10	26 7	21 10	22 5	21 0	17 2	16 5
,, 16 ...	27 7	25 6		27 1	21 6		21 1	17 3	
,, 23 ...	28 9	26 1		26 5	21 9		21 6	17 9	
,, 30 ...	29 9	26 10		27 5	22 1		21 10	18 0	
May 7 ...	30 9	27 6		26 10	21 10		22 6	18 2	
,, 14 ...	31 1	27 9		25 3	22 5		22 5	18 4	
,, 21 ...	31 6	27 10		25 4	23 7		22 6	18 5	
,, 28 ...	31 6	27 8		25 1	23 7		22 10	18 5	
June 4 ...	31 3	27 6		24 3	23 10		22 11	18 4	
,, 11 ...	30 11	27 8		23 8	21 5		22 8	18 7	
,, 18 ...	30 6	27 6		23 5	20 7		23 0	18 3	
,, 25 ...	30 5	27 6		24 3	22 0		22 9	18 6	
July 2 ...	30 8	27 9		25 5	20 7		22 5	18 6	
,, 9 ...	30 10	28 1		24 8	19 11		22 10	18 3	
,, 16 ...	30 11	28 3		23 8	20 5		22 10	18 7	
,, 23 ...	31 5	28 7		25 0	20 10		22 8	18 5	
,, 30 ...	31 8	28 11		25 0	21 0		22 10	18 6	
Aug. 6 ...	31 7	29 3		24 11	20 1		22 11	18 8	
,, 13 ...	31 7	29 11		24 9	21 3		22 2	18 10	
,, 20 ...	31 5	29 9		22 10	20 4		21 11	18 6	
,, 27 ...	31 7	30 0		26 2	22 3		21 0	18 7	
Sept. 3 ...	29 9	30 3		24 6	22 5		19 10	18 5	
,, 10 ...	27 10	28 6		27 5	22 4		19 2	17 0	
,, 17 ...	27 1	27 5		26 4	24 2		18 4	16 4	
,, 24 ...	26 6	27 0		26 4	24 0		18 0	16 2	
Oct. 1 ...	25 10	26 3		25 11	23 9		17 5	15 9	
,, 8 ...	25 5	25 10		26 2	23 8		17 2	15 6	
,, 15 ...	25 1	25 8		26 1	23 9		17 0	15 5	
,, 22 ...	24 11	25 10		26 4	23 7		17 0	15 8	
,, 29 ...	25 0	26 0		26 7	24 2		17 3	15 8	
Nov. 5 ...	25 1	26 4		26 3	24 3		17 2	15 9	
,, 12 ...	25 0	26 6		25 11	24 6		17 3	15 9	
,, 19 ...	24 11	26 9		25 6	24 3		17 2	15 10	
,, 26 ...	25 0	26 6		24 11	23 11		17 0	15 11	
Dec. 3 ...	25 1	26 8		24 4	23 9		17 0	15 9	
,, 10 ...	25 0	26 7		24 3	23 2		16 10	15 9	
,, 17 ...	24 10	26 9		24 2	23 0		16 10	15 7	
,, 24 ...	24 10	26 5		24 1	22 5		16 8	15 6	
,, 31 ...									

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** per Imperial Quarter as returned under the Corn Returns Act, 1882, for ENGLAND AND WALES and at certain towns, in the Month of March, 1903 and 1904.

PLACE.	WHEAT.		BARLEY.		OATS.	
	1903.	1904.	1903.	1904.	1903.	1904.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
ENGLAND & WALES...	25 1	28 7	22 9	22 7	16 11	16 6
London	25 9	29 0	21 9	20 10	17 11	17 2
Norwich	25 0	29 3	22 0	21 11	16 4	15 9
Lincoln	24 10	27 10	22 6	22 1	16 4	16 4
Peterborough ...	23 11	27 9	21 5	20 8	16 5	15 6
Doncaster	25 3	27 6	23 1	24 10	16 8	16 8
Salisbury	25 2	28 8	22 0	22 1	16 11	16 7

* Section 8 of the Corn Returns Act, 1882, provides that where returns of purchases of British Corn are made to the local inspector of Corn Returns in any other measure than the imperial bushel or by weight or by a weighed measure that officer shall convert such returns into the imperial bushel, and in the case of weight or weighed measure the conversion is to be made at the rate of 60 imperial pounds for every bushel of wheat, 50 imperial pounds for every bushel of barley, and 39 imperial pounds for every bushel of oats.

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN and BRESLAU.

—		WHEAT.		BARLEY.		OATS.	
		1903.	1904.	1903.	1904.	1903.	1904.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France :	January ...	36 7	35 10	23 0	22 4	19 1	16 9
	February ...	38 1	35 10	23 3	22 5	19 3	16 9
Paris :	January ...	37 2	35 9	23 7	22 2	18 9	17 0
	February ...	39 7	35 9	23 10	22 2	19 2	17 4
Belgium :	January ...	27 3	28 2	22 6	21 5	17 9	15 9
	February ...	27 4	—	22 5	—	17 9	—
Berlin :	January ...	—	35 7	—	—	—	18 3
	February ...	34 1	37 0	—	—	20 4	18 3
Breslau :	January ...	31 2	34 0	24 2	23 0	17 10	16 1
	February ...	31 4	35 4	24 2	22 3	18 0	15 11

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of March, 1904.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per cwt.	per cwt.	per cwt.	per cwt.
British	14 0	12 9	13 6	12 4	—	—	—	—
	per cwt.	per cwt.	per cwt.	per cwt.				
Irish	—	—	95 6	91 6	—	—	—	—
Danish ...	111 6	109 6	113 6	108 6	114 3	110 9	112 6	—
French Crocks, etc.... ...	110 0	105 0	—	—	—	—	—	—
Australian ...	98 0	93 6	96 6	93 6	98 0	94 6	99 9	96 3
New Zealand...	98 6	95 0	102 9	99 6	101 3	98 3	101 9	97 0
CHEESE :—								
British Cheddar	72 6	67 6	72 0	65 9	76 0	70 0	64 6	58 6
					120 lb.	120 lb.		
,, Cheshire	—	—	—	—	76 6	72 9	—	—
					per cwt.	per cwt.		
Canadian ...	51 6	50 3	53 9	51 6	51 6	48 6	54 0	51 0
BACON :—								
Wiltshire ...	72 6	68 6	67 6	64 0	—	—	—	—
Irish	56 6	50 6	58 0	54 0	56 6	54 0	55 0	52 6
Canadian ...	47 0	44 3	48 3	46 0	45 3	42 0	45 3	42 9
HAMS :—								
Cumberland ...	96 0	90 0	94 6	89 0	—	—	—	—
Irish	93 0	82 9	91 3	80 0	—	—	86 0	76 0
American ...	51 0	49 3	—	—	49 9	—	48 9	46 3
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	10 10	9 9	11 0	10 0	—	—	—	—
Irish	9 0	8 1	9 3	8 4	8 0	7 6	8 1	7 6
Danish ...	10 1	8 4	10 0	9 0	—	—	8 5	7 4
POTATOES :—	per ton	per ton	per ton	per ton	per ton	per ton	per ton	per ton
Main Crop ...	105 0	96 3	107 6	103 0	105 0	95 0	105 0	90 0
Up-to-Date ...	105 0	95 7	105 0	100 0	91 8	85 0	90 0	80 0
HAY :—								
Clover... ...	88 11	77 9	80 0	75 0	80 0	—	87 6	77 6
Meadow ...	82 3	73 11	75 0	70 0	57 6	45 0	—	—

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	March.		3 Months Ended March.	
	1904.	1903.	1904.	1903.
Swine-Fever:—				
Outbreaks	83	105	320	353
Swine Slaughtered as diseased or exposed to infection ...	412	562	1,870	1,634
Anthrax:—				
Outbreaks	83	56	271	204
Animals attacked	113	85	369	323
Glanders (including Farcy):—				
Outbreaks	130	105	368	303
Animals attacked	232	160	719	538
Sheep-Scab:—				
Outbreaks	129	146	831	953
Animals attacked	*	1,934	*	10,064

* Returns not yet fully available.

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	March.		3 Months Ended March.	
	1904.	1903.	1904.	1903.
Swine-Fever:—				
Outbreaks	9	6	29	13
Swine Slaughtered as diseased or exposed to infection ...	202	156	671	407
Anthrax:—				
Outbreaks	1	—	2	—
Animals attacked	1	—	2	—
Glanders (including Farcy):—				
Outbreaks	—	—	2	1
Animals attacked	9	—	18	2
Sheep-Scab:—				
Outbreaks	†	76	†	331

† Returns not yet received.

LIST OF LEAFLETS ISSUED BY THE BOARD OF AGRICULTURE AND FISHERIES.

(*a.*) *Leaflets dealing with Insects and Fungi injurious to Crops.*

No.	Title.	No.	Title.
1	Black Currant Mite.	47	Asparagus Beetle.
2	Vine, Plum, Hop and Raspberry Weevils.	48	Pea and Bean Thrips, or Black Fly.
3	"Flea" Beetles.	49	Fruit Tree Beetle.
4	Winter Moths.	52	Gooseberry Mildew.
5	Mangold Fly.	53	Pear Midge.
10	Wireworms.	56	Canker Fungus.
11	Daddy Longlegs or Crane Fly.	60	Goat Moth & Wood Leopard Moth.
12	Gooseberry Saw Fly.	62	Pear and Cherry Saw Fly.
14	Raspberry Moth.	64	White Root Rot.
15	Apple Blossom Weevil.	65	Small Ermine Moths.
16	Apple Sucker.	68	Currant Aphides.
19	Pea and Bean Weevils.	69	Tent Caterpillars.
20	The Magpie Moth.	70	Winter Washing of Fruit Trees.
22	Diamond-back Moth.	75	Root-knot Disease in Cucumbers and Tomatoes.
23	Potato Disease.	76	Cucumber and Melon Leaf Blotch.
24	Ribbon Footed Corn Fly.	77	Finger-and-Toe in Turnips.
25	Chafer-beetles or White-Grubs.	86	Brown Rot of Fruit.
30	Codling Moth.	87	Fungus Disease of Young Fruit Trees.
31	Onion Fly.	88	Hop Aphis.
33	Surface Caterpillars.	90	Pith Moth.
34	Woolly Aphis or Apple Root Louse.	91	Pine Beetle.
35	Celery Fly.	92	Bunt and Smut.
38	Carrot Fly.	94	Millipedes and Centipedes.
41	Red Spiders.	103	Pine Saw Fly.
46	Stem Eelworm.		

(*b.*) *Leaflets dealing with Wild Birds.*

40	Kestrel or Wind-hover.	50	Water Wagtails or "Dishwashers."
42	Short-Eared Owl.	51	White or Barn Owl.
43	Titmice.	54	Spotted Flycatcher.
44	Lapwing, Green Plover, or Peewit.	55	Swallow.
45	Starling.	84	House Sparrow.

(*c.*) *Leaflets dealing with Animals, including Poultry.*

13	Acorn Poisoning.	82	Preparation of Wool for Market.
21	Warble Flies.	83	Preservation of Eggs.
28	Anthrax.	89	Fluke, or Liver Rot in Sheep.
29	Swine Fever.	95	Ringworm in Calves.
57	External Parasites of Poultry.	96	Parturient Apoplexy.
58	Internal Parasites of Poultry.	100	Pig Breeding and Feeding.
61	Sheep Scab.	101	Prevention of White Scour in Calves.
67	Favus in Poultry.	102	Quarter Ill, Quarter Evil, or Black Leg.
78	Liver Disease of Poultry.		
81	A Substitute for Dishorning.		

(*d.*) *Leaflets relating to Acts of Parliament.*

8	Farmers and Assessments to Local Rates.	26	Farmers and the Income Tax.
		27	Remission of Tithe Rentcharge.
18	Fertilisers and Feeding Stuffs Regulations, 1897.	39	Assessment to Land Tax.
		66	Workmen's Compensation Act, 1900.

(*e.*) *Leaflets dealing with Miscellaneous Subjects.*

6	Voles and their Enemies.	80	Use of Artificial Manures.
9	Ensilage.	85	Haymaking.
32	Foul Brood or Bee Pest.	93	Farmyard Manure.
36	Cultivation of Osiers.	97	Farmers' Co-operative Societies.
63	Destruction of Charlock.	98	Grading and Packing Fruit and Vegetables.
72	Purchase of Artificial Manures.		
73	Cultivation of Maize for Fodder.	99	Relationship of Woods to Domestic Water Supplies.
74	Purchase of Feeding Stuffs.		
79	Rations for Farm Stock.		

The issue of Leaflets 7, 17, 37, 59 *and* 71 *is suspended.*

Copies of these Leaflets may be obtained free of charge and post free on application to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W. Letters of application so addressed need not be stamped.

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THE "BOARD OF TRADE JOURNAL."

The "Board of Trade Journal," now published weekly at the cost of one penny, is the principal medium through which intelligence collected by the Commercial Intelligence Branch of the Board of Trade and intended for general information is conveyed to the public. It contains notices of contracts for tender and other openings for trade abroad; particulars of changes affecting British trade in foreign and colonial customs tariffs; special articles on the trade and industries of foreign countries and British possessions; items of interest under such sectional headings as "Proposed Tariff Change," "Shipping and Transport" (containing port charges and changes, new steam-ship-lines, trade and rates, &c.); "Minerals, Metals and Machinery," &c., and other information likely to be useful to manufacturers and traders. Various statistical tables and reviews of recent Government publications are also included in the contents.

The "Board of Trade Journal" is issued every Thursday morning, and single copies may be obtained direct from the publishers, Messrs. Eyre & Spottiswoode, East Harding Street, Fleet Street, E.C., at a cost of 1d., or it may be subscribed for (post free) at the rate of 6s. 6d. per annum for the United Kingdom.

THE "LABOUR GAZETTE."

The "Labour Gazette," the Journal of the Labour Department of the Board of Trade, contains an article each month on the state of employment among agricultural labourers in the various parts of the United Kingdom. Special articles also appear therein from time to time on the rates of wages paid to agricultural labourers, the Hiring Fairs in Great Britain, and on migratory Irish agricultural labourers. The "Labour Gazette" is issued on the 15th of each month, and may be obtained direct from the publishers, Messrs. Horace Marshall and Son, Temple House, Temple Avenue, London, E.C., at the rate of 2s. per annum, post free. Copies may also be ordered through any newsagent, price 1d. each.

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THE JOURNAL
OF THE
BOARD OF AGRICULTURE.

Vol. XI. No. 2.

MAY, 1904. [NEW SERIES.]

RAILWAY RATES FOR AGRICULTURAL PRODUCE.

The Board of Agriculture and Fisheries consider it desirable to give publicity to the following correspondence which has passed between them and the Railway Companies in Great Britain, as to the carriage by rail of agricultural produce and requisites, together with a copy of the minute appointing a Departmental Committee to enquire into Railway Rates for foreign and Colonial agricultural produce.*

I.

Board of Agriculture and Fisheries to Railway Companies in Great Britain.

Board of Agriculture, 4, Whitehall Place,
London, S.W.,
28th September, 1903.

SIR,—I am directed by the President of the Board of Agriculture to inform you that since his appointment to office he has been giving his attention to the general subject of the existing facilities and charges for the conveyance of agricultural requisites and agricultural produce. The necessity of improvement in these respects has been pressed upon Lord Onslow in many directions, and the question is undoubtedly regarded as being one of great importance to the prosperity of the rural districts at the present time.

In these circumstances Lord Onslow felt that it would probably be of advantage both to those in whose service he is engaged, and to the Railway Companies, if he could have an opportunity of personal conference with the General Managers of the leading lines, in order that he might learn, in the first

* This correspondence, with appendices showing the facilities at present offered by Railway Companies for the conveyance of agricultural produce at reduced rates, has now been published as a Parliamentary Paper. [Cd. 2045.] Price 10d.

place, their views with regard to the principal complaints and suggestions which have been made by agriculturists, and, in the second place, to ascertain what can be done by consignors of agricultural produce, either individually or in combination, to obtain for themselves the best possible terms and facilities for the carriage of their goods.

Sir Frederick Harrison, the General Manager of the London and North-Western Railway, to whom Lord Onslow addressed himself in the first instance, was good enough to bring Lord Onslow's desire under the notice of his colleagues, with the result that the General and Traffic Managers of the leading lines of railway very courteously responded to the invitation thus addressed to them, and attended, either personally or by their representatives, at a Conference which met at this office on the 29th July last, a representative of the Board of Trade being also present.

The following Companies took part in the Conference, viz. :—London and North-Western Railway, London and South-Western Railway, Great Western Railway, Great Northern Railway, Great Eastern Railway, Midland Railway, Great Central Railway, Caledonian Railway, Cambrian Railway.

The Conference was of a somewhat informal character, and it was not possible for the subjects which were presented for consideration to be discussed in any detail. But the exchange of views which then took place made it abundantly clear that the Companies represented were very ready to consider, in a fair and reasonable spirit, any representations which might be made to them by agriculturists, either directly or through the agency of the Board themselves.

At the termination of the Conference it was agreed that it would be desirable that the Board should bring under the notice of individual Railway Companies the various topics which had been discussed in general terms, and in pursuance of this understanding Lord Onslow now desires me to submit the following observations, and to ask that they may receive the consideration of your Directors, and of the various officials concerned :—

1. *Conveyance of Small Parcels of Farm and Dairy Produce.*

It has been suggested to Lord Onslow that many of the smaller class of farmers would be assisted in the marketing of

their produce if special rates, on a mileage scale, were charged for small consignments of butter, cream, cheese, eggs, honey flowers, seeds (garden and agricultural), fruit, vegetables, mushrooms, fresh meat, game, rabbits, and poultry, sent by passenger train. Some of the Companies have already made concessions of importance in this direction, and Lord Onslow would be glad if your own Company would take the matter into their favourable consideration, with a view to giving to farmers on their lines the best possible facilities of the kind. In any case he would be obliged if you would supply him with a copy of the scale of charges at present made by your Company for the carriage of parcels of the character of those in question.

2. *Aggregation of Mixed Consignments.*

The information in the possession of the Board points to the great importance of the aggregation of produce in such a way as to secure for consignors the benefit of the lower rates charged for the carriage of large consignments.

Lord Onslow's attention has been called to the fact that certain Companies have been good enough to give special attention to this matter, and to promise lower rates for lots of one ton, two tons, and three tons and upwards as compared with smaller lots, and that where mixed consignments are forwarded from one station to another station by one consignor or to one consignee (one of whom will pay the carriage), the charge will be upon the gross weight of the consignment, so that traders obtain the benefit of lower rates if the minimum quantity is made up by a combination of various articles, or a number of senders entrust the duty of consigning to one of their body or to an independent agent.

It is understood that the local representatives of many of the Companies have been instructed to confer with intending senders, when desired, and to afford such information and advice in regard to the matter as will enable them to take full advantage of the lower rates for large quantities.

Arrangements such as these should be of considerable service to agriculturists, and Lord Onslow would be glad to learn that your Company would be prepared to afford similar facilities. He would also be obliged by any suggestions which you may be

able to make as to the practical steps which might be taken by those for whose advantage arrangements such as those referred to are devised.

3. *Loss and Damage of Produce conveyed at Owner's Risk.*

Representations have from time to time been received by the Board as to the hardship which arises in cases in which consignments of agricultural produce are lost or damaged, in consequence of the negligence or misconduct of the servants of a Railway Company, but in which no compensation is recoverable by the consignor owing to the fact that the goods were carried at less than the normal rate and at his own risk. It is of course to be remembered that the consignor in such a case has contracted himself out of any right to look to the Company for redress, but at the same time it is easy to understand that a considerable sense of hardship is excited if this view of the matter is adhered to, whatever may be the fault of the servants of the Company.

The Board understand that the Companies have decided that they will consider claims in respect of the total loss in transit, and that they will not refuse to make reasonable compensation in such cases, contributory negligence on the part of the senders or consignees being of course taken into consideration.

It is also understood that the Companies will consider favourably cases where partial loss or damage arises from circumstances which indicate extreme negligence on the part of their servants.

There can be no doubt that concessions of this character, administered in a reasonable spirit, would remove a painful cause of controversy and friction. Lord Onslow desires to bring the matter under the notice of your Company, and to express the hope that it may receive careful consideration if it has not already done so.

4. *Provision of Special Waggons, or Waggons suitable for Particular Classes of Traffic.*

The Board have received several complaints with regard to the failure of Companies to provide special waggons for stock, in cases in which a higher charge for carriage has been payable,

by reason of such failure, than would otherwise have been the case. Lord Onslow recognises that the Companies are under no legal obligation to provide any particular kind of waggon in order to enable consignors to take advantage of any special or reduced rate, and it is obvious that they could hardly carry on their business if they did not generally maintain this principle. But friction would be avoided and consignors would feel that they were being equitably treated, if the Companies would make a general rule that where reasonable and sufficient notice has been given they will carry at the lower rate if they fail to provide the special waggon required.

The same course might be adopted where there is a special rate for a minimum load per truck (*e.g.*, special rates for 30 cwt. of hay to the truck), and small trucks only are provided, with the result that two trucks are required to carry the minimum load, and are charged for at the higher rate.

Lord Onslow believes that some Companies already adopt this rule, at any rate in cases in which the consignor presses for a reduction. If the practice could be made a general one, it would certainly conduce to a more friendly feeling between carriers and consignors.

5. *Local Conferences.*

It was suggested at the meeting which took place at this Office on the 29th July last, that it would be of advantage that local conferences should be held from time to time at which representatives of the Companies might attend in order to discuss with agriculturists any questions as to rates or facilities which presented themselves for settlement. At such conferences it might be of service that a representative of the Department should be present. The result might be, on the one hand, to enable the Companies to ascertain what were the requirements of their customer, and, on the other hand, to clear away misconceptions which sometimes exist with regard to the charges and arrangements of the Companies themselves.

The suggestion met with very general approval on the part of those who were present at the meeting, it being pointed out that many Companies already endeavoured through their agents thus to get into touch with agriculturists in their respective districts.

In these circumstances Lord Onslow desires me to enquire whether the proposal commends itself to your Company, and whether they would be prepared to afford facilities for the purpose. If so the Board would propose to arrange Conferences of the kind between such persons and at such places and times as might be found to be mutually convenient. At these Conferences complaints and suggestions made by individual agriculturists could, amongst other things, be taken into consideration.

6. *Issue of Information and Advice.*

It is of considerable importance that the arrangements made by the various Companies for the carriage of agricultural produce and requisites should be brought to the knowledge of farmers in a clear and simple form, and that assistance and advice should from time to time be given by the Companies in order that consignments may reach their destination cheaply, expeditiously, and in good marketable condition. Useful work has recently been done in this direction by the issue of special pamphlets and notices on the subject. Lord Onslow would be glad if this matter might also be considered, and to learn whether you think that the Board themselves could be of any assistance with regard to it; for example, by the issue of information in a convenient form to County Councils, Chambers of Agriculture, Farmers' Clubs, Agricultural Societies, and other bodies likely to be able to give publicity to it in their respective districts. The Board would be very glad to co-operate with your Company in the issue of any information as to the packing and consignment of produce which would be likely to be of service to those concerned.

7. *Foreign and Colonial Produce.*

An impression undoubtedly exists in agricultural circles that foreign and Colonial agricultural produce is conveyed from the ports to the great centres of consumption at rates which compare favourably with those charged for the carriage of British produce from inland stations. The evidence which has, from time to time, been adduced in support of this belief is not of a

satisfactory character, and Lord Onslow is of course well aware that if undue preference could be proved a remedy is provided by Statute. At the same time Lord Onslow is of opinion that better relations between consignors and carriers would be established if the Companies would place him in a position to issue such information to agriculturists as would enable them to see clearly that, taking into consideration the circumstances of the traffic, as regards its quantity, its packing, its regularity, and all other matters affecting its cost to the Company, except so far as they may be matters special to the foreign origin of the goods, the home traffic is placed in a position of strict equality with the foreign traffic.

Lord Onslow would therefore be glad to receive information which might be placed before agriculturists as to the rates and conditions specified for the carriage of the principal items of foreign and Colonial agricultural produce from the ports of arrival to the great urban centres, with similar information as to sea freights where the Companies are also the owners of lines of steamships. Some indication of the principles which guide the Companies in the settlement of these rates and conditions might at the same time be given. By this means greater confidence in their propriety would, in Lord Onslow's opinion, be established, and difficulty and friction avoided.

8. *Rates and Charges from Rural Stations.*

Complaint is not infrequently made that in certain cases the rates for particular descriptions of produce from stations serving agricultural districts to large towns are higher than the rates charged for longer distances to the same towns from other centres of population.

Lord Onslow is aware that such anomalies cannot be altogether avoided, especially in the face of competition with carriage by water, but he is of opinion that something might be done in the direction of the equalisation of the rates for the carriage of goods from the rural districts with those enjoyed by traders in urban districts. In view of the great importance from every point of view of encouraging all who carry on their industries in rural districts, Lord Onslow trusts that the Com-

panies will be willing to examine carefully this branch of the subject.

In submitting these observations for the consideration of your Company, Lord Onslow desires again to acknowledge the very friendly and reasonable spirit in which the General Managers have met him in the matter, and to express the hope that the results of the action which with their assistance he is now taking may be of practical benefit to all concerned. He would propose at a later date to publish, for the information of Parliament and of agriculturists, this letter and any reply to it with which you may favour him,

I am, Sir, your obedient servant,

(*Signed*) T. H. ELLIOTT,

The General Manager, Secretary.

——— Railway Company.

II.

Reply on behalf of the Railway Companies to the preceding Circular Letter.

Railway Clearing House,
Seymour Street, Euston Square,
London, 19th January, 1904.

SIR,—The circular letter dated 28th September, 1903, addressed by the Board of Agriculture to the Railway Companies in Great Britain, having reference to the carriage of Agricultural Produce and Requisites by railway, has received the careful consideration of the various Railway Companies, and at a meeting of the General Managers held here on the 15th instant I was desired, as a matter of convenience, to reply on behalf of the Companies generally, to the observations of the Board, as follows:—

1. *Conveyance of Small Parcels of Farm and Dairy Produce.*

There are already specially low rates in operation on all railways for farm and dairy produce in small quantities, as well as still lower exceptional rates for larger quantities, and the, Companies are of opinion that these rates, generally speaking

sufficiently meet the case. The rates are published by many of the Companies in their passenger time tables as well as by prominent posters at their stations, and by the issue of handbills and pamphlets, and for the larger quantities in the public rate-books at the stations.

2. *Aggregation of Mixed Consignments.*

The principle of charging aggregated consignments is already provided for by the Railway Companies, and they are quite ready to afford such information and advice to intending senders as will enable them to take full advantage of the lower rates for large quantities, and of the arrangements that already exist for the aggregation of mixed consignments.

No doubt this information could be disseminated at the local conferences referred to in paragraph 5 hereof, and the opportunity would be then afforded of discussing with the railway representatives any suggested modification of the rates to enable the produce to be sent to suitable markets. The Railway Companies feel that in very many cases it is not their charges, but other charges and circumstances that are the real impediment.

3. *Loss and Damage of Produce conveyed at Owner's Risk.*

Whilst the Railway Companies must maintain their legal position in respect to traffic conveyed at the owner's risk, it is their practice, in a friendly way, to consider on their merits any cases of total loss, proved pilferage, or mis-delivery.

4. *Provision of Special Waggons, or Waggons suitable for particular Classes of Traffic.*

It is understood that this refers to prize and other valuable animals, and the Companies have already had, and still have, this question under their consideration. The real difficulty is the very fluctuating character of the traffic.

The Companies are unaware of any difficulties in respect to loading of the kind referred to, as they are able without difficulty to load hay up to 30 cwt. per truck.

5. *Local Conferences.*

Whilst it has been the frequent practice of the Railway Companies to meet traders and others by deputation or otherwise on such matters, the Railway Companies cordially acquiesce in the suggestion that there should be local conferences held between the agriculturists, the Agricultural Department, and the Railway Companies, and they would be willing to arrange for the representatives to attend such conferences, believing it would be the means of removing a great deal of misconception. It would, however, be desirable that the Railway Companies should be furnished with particulars as to any complaints of rates and facilities, so that exact information may be obtained before any meeting takes place. It should be borne in mind that at the present time the Railway Companies, through their agents and representatives, are in touch not only daily at their stations with the senders of traffic, but more especially at the periodical corn markets and live stock sales.

6. *Issue of Information and Advice.*

The Companies generally have for a long time past taken steps to disseminate amongst the agricultural community all information as to their rates and arrangements, but they would be glad if the Board of Agriculture could inculcate the desirability amongst farmers and others of co-operation, combination, and the better packing of their traffic, in any way most suitable.

The Companies would be willing to distribute pamphlets issued by the Board of Agriculture, to the station agents for circulation in the neighbourhood to those to whom the information would be of service.

7. *Foreign and Colonial Produce.*

The railway rates from ports to inland stations are not applicable exclusively to foreign produce, the rates being on the contrary applied indiscriminately to home-grown, foreign, or Colonial produce, so long as the conditions attaching to them are complied with.

The request for information as to rates and conditions is of so general a character that it is felt that any information which the Companies would be in a position to furnish would not be of any practical value.

8. *Rates and Charges from Rural Stations.*

The Companies are unable to admit that this complaint has any general application.

In conclusion, I am desired to say that in any instance where it is shown that apparent disparity in rates exists, the Companies are always prepared to consider such cases, having regard, of course, to the varying circumstances; and I am to assure you that the Companies are fully sensible of the importance of fostering and encouraging this great industry, and will gladly continue to do all they legitimately can in this direction.

I am, Sir, your obedient servant,

(*Signed*) H. SMART,

Secretary.

Sir T. H. Elliott, K.C.B.,
Secretary, Board of Agriculture,
4, Whitehall Place, London, S.W.

III

Board of Agriculture and Fisheries to the Secretary of the Railway Clearing House.

Board of Agriculture and Fisheries,
4, Whitehall Place,
London, S.W.,
16th April, 1904.

SIR,—I am directed by the President of the Board of Agriculture and Fisheries to advert to your letter of the 19th January last as to the carriage of agricultural produce and requisites by railway, and to express his thanks for the attention which the various Railway Companies have been good enough to give to the circular letter addressed to them on the 28th September last.

1. *Conveyance of Small Parcels of Farm and Dairy Produce.*
2. *Aggregation of Mixed Consignments.*

Lord Onslow is glad to take note of the assurances given by the Companies as to their general policy in these matters, but he desires me to observe that the information before him goes to show that the practice of the various lines is by no means uniform, either as regards the rates charged in respect of the carriage of small parcels or in cases in which consignments are aggregated, *e.g.*, when two or more farmers make up a truck load of sheep between them, or a number of horses are consigned at one and the same time. Lord Onslow trusts that these matters will receive further attention at the hands of individual Companies, in order that, so far as is practicable, agriculturists may have no reason to complain that they are receiving less favourable treatment from one Company to that which would be accorded to them elsewhere.

3. *Loss and Damage of Produce conveyed.*

Lord Onslow believes that the decision of the Companies that they will consider on their merits, in a friendly way, any cases of total loss, proved pilferage, or mis-delivery, will do much to remove the sense of hardship which from time to time arises under this head, and he desires me to express his appreciation of the policy adopted in the matter. He would, however, venture to hope that such instructions may be issued to the various subordinate officers concerned as will secure the administration of the concession in a liberal spirit and with as little complication and difficulty as may be practicable. In this connection Lord Onslow desires me to take the opportunity of saying that he has recently received very numerous complaints as to the unsuitable, and even insanitary, conditions under which milk is from time to time conveyed. It is not necessary for him at the moment to enter into any detail on this subject, but the Companies will recognise the serious results which must inevitably follow the carriage of so sensitive an article as milk in uncleanly waggons, or with commodities likely by their character to affect it deleteriously. He would earnestly invite attention to the subject, and would suggest that definite instructions should be issued by the Companies to their servants with

respect to it, and that steps should be taken to secure full compliance therewith.

4. *Provision of Special Waggons, or Waggons suitable for particular Classes of Traffic.*

Lord Onslow notes that this question is receiving the consideration of the Companies, and he would be obliged if he might be informed so soon as practicable of the conclusions arrived at respecting it. He would also be glad if the Companies would give their consideration to the question of the carriage of calves, where they are accepted for carriage by passenger train, with a view to fixing some scale so that the charges made should bear some proportion to the weight of the animal in every case.

5. *Local Conferences.*

Lord Onslow is glad that the Railway Companies concur with him in the view that conference between agriculturists and representatives of the Companies and of this Department would often be the means of removing misconception and of promoting friendly relations between the various interests concerned. Instructions will be issued to the Inspectors of the Board to place themselves from time to time in communication with the Companies where there is reason to believe that a local conference would be of value. The Board have now at their disposal ample means of obtaining through their local agricultural correspondents information as to the existence of complaints as to rates and facilities, and they agree that it would be useful that the Companies should be furnished with particulars of any such complaints before a meeting is arranged and held.

6. *Issue of Information and Advice.*

Lord Onslow is obliged by your reply to his observations on this point. He proposes shortly to publish in a Parliamentary Paper, as an Appendix to the correspondence which has taken place, particulars of the conditions and rates prescribed by the principal Companies for the conveyance of farm, dairy, and market garden produce at reduced charges. Additional publicity will thus be secured for the arrangements which the Companies

have made in this respect in a form convenient for reference by those concerned.

7. Foreign and Colonial Produce.

8. Rates and Charges from Rural Stations.

Lord Onslow had hoped that the publication of such information as the Companies might have been in a position to supply in response to his enquiries under these heads might have had the effect of removing the existing feeling amongst agriculturists that they are not fairly treated as compared with consignors of agricultural produce from the ports of arrival and the larger urban centres. He recognises, however, the difficulties and the extensive and onerous correspondence which would probably have arisen if publicity had been given to the information asked for without examination and explanation. He has recently had the advantage of personal communication with the Chairmen of some of the Companies owning lines of steamers and mainly concerned with the carriage of produce between the Continent and the Channel Islands and this country, who have kindly promised to afford him every facility in the matter. Lord Onslow therefore proposes to appoint a Departmental Committee—

> "To enquire as to the rates charged by Railway Companies in Great Britain in respect of the carriage of foreign and Colonial farm, dairy, and market garden produce from the port of shipment or of arrival to the principal urban centres, and to report whether there is any evidence to show that preferential treatment is accorded to such produce as compared with home produce, and, if so, what further steps should be taken, either by legislation or otherwise, to secure the better enforcement of the law in the matter."

The enquiry would naturally commence with those Companies with the Chairmen of which Lord Onslow has recently been in personal communication, but he believes that the appointment of the Committee, the constitution of which he hopes shortly to be able to announce, may do much to promote friendly relations between the Companies and the great industry of which he is the official representative, and he trusts therefore that the

Companies generally will concur with him in this opinion, and favour him with their co-operation in the matter.

I am, Sir, your obedient servant,

(*Signed*) WM. SOMERVILLE,

Assistant Secretary.

The Secretary,
Railway Clearing House,
Seymour Street, Euston Square,
London, N.W.

IV.

Minute of the President of the Board of Agriculture and Fisheries appointing a Departmental Committee on Railway Rates.

I hereby appoint a Committee to enquire as to the rates charged by railway companies in Great Britain in respect of the carriage of foreign and Colonial farm, dairy, and market garden produce from the port of shipment or of arrival to the principal urban centres, and to report whether there is any evidence to show that preferential treatment is accorded to such produce as compared with home produce, and, if so, what further steps should be taken either by legislation or otherwise to secure the better enforcement of the law in the matter.

The Committee will be constituted as follows :—

The Right Hon. the Earl of Jersey, G.C.B., G.C.M.G.
Sir James Lyle Mackay, G.C.M.G., K.C.I.E.
Col. Sir Herbert Jekyll, K.C.M.G., R.E., an Assistant Secretary of the Board of Trade.
Sir Charles John Owens.
Mr. Alfred Baldwin, M.P.
Mr. Ernest George Haygarth Brown, a Superintending Inspector of the Board of Agriculture and Fisheries.
Col. William Slaney Kenyon-Slaney, M.P.

And I hereby appoint—

The Right Hon. the Earl of Jersey to be Chairman ; and
Mr. Edgar Cooper Stoneham of the Board of Trade to be Secretary of the said Committee.

(*Signed*) ONSLOW,
President of the Board of Agriculture and Fisheries.

22nd April, 1904.

CO-OPERATIVE POULTRY SOCIETIES IN IRELAND.

In Ireland we all keep poultry. The cottager, be he labourer or artisan, keeps a few fowls on his half-acre plot, or, if he has not a plot, he keeps them on the roadside. The farmer of 300 acres, as well as the small holder of three to ten acres, is a poultry-keeper, and fowls are kept in the towns, the villages, the cities and the suburbs, by shopkeepers, artisans, professional men and, indeed, by all manner of men or their wives.

Perhaps this is the reason why so many public bodies are engaged in helping forward the poultry industry, but another equally good reason is to be found in the great demand which there is for poultry and eggs in Great Britain and Ireland. However this may be, it is certain that strenuous efforts have been made for some years past to develop the poultry business, and to establish the marketing of poultry and eggs on a sound commercial basis. The public bodies which have been, and still are, engaged in this useful work, are the Congested Districts Board, the Irish Agricultural Organisation Society, the Department of Agriculture, and the County Councils.

In this article I propose to deal only with the work done by the Irish Agricultural Organisation Society, with which I have for many years been intimately connected as poultry expert and organiser, and of which I can speak with some authority.

A description of the functions of the Irish Agricultural Organisation Society would require a special article, and I cannot in this short article say more than this—that the I.A.O.S., which is the familiar title in Ireland of the Irish Agricultural Organisation Society, is a body which was founded ten years ago by Sir Horace Plunkett and the Rev. T. A. Finlay, S.J., assisted by a committee of noblemen, business men, professional

men, farmers, and others, who worked together on a strictly non-political and non-sectarian basis; and that the main object of the society thus formed was to organise and establish co-operative productive societies throughout Ireland. Some 800 co-operative societies have been formed, covering a wide and varied field. The same principles govern the organisation and the work of all our societies, viz., loyalty, trust, and mutual self-help. Amongst the industries which they embrace are dairying, agriculture, poultry-keeping, gardening, fruit-culture, bee-keeping, home industries, parish banks, boot-making, shirt-making, &c.

Special experts were employed by the I.A.O.S. to organise and launch these various forms of co-operative societies, and after the I.A.O.S. had been engaged for some years in the formation of societies of different kinds, its attention was attracted by the possibilities of the poultry industry. It was seen that in addition to the home supply, the people of Great Britain imported upwards of six million pounds' worth of eggs annually from foreign countries. The Irish supply was only valued at £2,000,000, and they were handled so badly and kept so long before being exposed for sale, that the mere name of an Irish egg was something to sniff at, and many of the eggs themselves were used for manufacturing purposes and not for food. The I.A.O.S. has done much within recent years to increase the output of Irish eggs and to improve the quality, and, after English and French eggs, Irish eggs are now much sought after.

The increase in the output of eggs and the improvement in quality have been brought about through the medium of co-operative poultry societies, but it must not be supposed that the work of the societies ends here. As a matter of fact, it neither begins nor ends with that branch of the business which consists in handling and marketing eggs, but the operations of societies are extended to the improvement of breeds of poultry, instruction to members through leaflets, lectures and other means in the best methods of breeding, rearing and feeding poultry, and also to the fattening, handling and marketing of all classes of poultry. In a word, I may say that anything which can be done to improve the condition of the Irish poultry

industry is considered legitimate work for a co-operative poultry society.

In order to give my readers a clear idea of the constitution and functions of our co-operative poultry societies, I think the best course is to take a typical society as a model and describe its constitution and its work. With this object I have selected the Dervock Poultry Society, which is situated near Ballymoney, in county Antrim. Nearly all the photographs taken to illustrate this article were taken on the premises of the Dervock Society.

This society was established in October, 1901, with a membership of about 500 and a paid-up capital of about £250. Since that time the membership has increased to 700, and the paid-up capital is now £350. The nominal capital is £700, so that it appears half has been called up. The nominal value of the shares is only 5s. each, and in order to become a member of the society it is compulsory to take at least one share. The purpose in fixing the value of shares so low as 5s. is in order that every person in the locality, rich or poor, may become a member by taking one share, but a scale has been laid down to regulate the number of shares which each member ought to take. The poor man, who keeps twenty-five hens or less, may join the society by taking one share, but the farmer who keeps one hundred hens must take four shares in order to qualify for membership. The scale is one share to be taken for every twenty-five hens kept. The 700 members of this society have taken, on an average, four shares each, so that the average size of the flocks may be taken at one hundred hens. There are many labourers who keep only twenty to thirty, but there are some farmers who keep 200 or 300.

The society is a limited liability company, so that each member is liable only for the amount of his share or shares. It is governed by a committee of ten members, elected by the shareholders, and in the election of the committee every member has one vote only, whether he holds one share or more.

Subject to the committee there is a paid manager, who must be a thoroughly competent business man, and he is paid a salary in accordance with the business and success of the society. The

manager of Dervock Society is paid £120 a year. The staff, in addition to the manager, consists of four box-makers and egg packers, two of whom are girls, and four collectors. These are busily engaged during the summer season in dealing with the egg business, but during the winter season they also work at the table-poultry business. The busiest season is immediately before Christmas, when some thousands of turkeys and geese are bought, killed and prepared for market, and it is necessary to engage extra workers, chiefly women, in order to deal with this special trade.

The Dervock Society works over a comparatively large area extending to five or six miles from the centre in Ballymoney direction and up to twelve miles in other directions. The eggs are gathered by four collectors, who travel to the houses of all members regularly, and by this means freshness of the eggs is ensured. The collectors are paid partly by commission and partly by wages; a good portion of the district is worked by the society's own horse and cart, and this is found more economical than hiring other men's horses to do the work.

The turnover in the egg department of this society is £6,000 per annum, which is paid for 2,160,000 eggs, having an aggregate weight of nearly 130 tons.

The premises occupied by Dervock Society consist of: (1) office; (2) shed for box-making; (3) storage and packing-room, in which all work connected with the weighing, testing, grading and packing of eggs is performed; (4) store-room for empty packing cases, straw, wood-wool, &c.; (5) stable, harness-room, and cart-house. These are situated in a convenient and central place adjacent to the railway station, and they are let to the society at a yearly rent of £6. The rent is low, but the buildings were not in good repair when they came into the hands of the society. They were simply some old buildings with a walled-in yard, which were taken by the committee and converted into suitable premises for the egg and poultry business.

The plant and fittings were not expensive considering the volume of work which is turned out. The following statement shows the approximate cost, and gives an idea of the money which must be sunk in the purchase of necessary stock and

appliances when a poultry society of this kind is being started :—

	£	s.	d.
1 horse, value	20	0	0
1 spring van and set of harness	18	0	0
1 set of large scales	4	0	0
5 sets small scales at £1	5	0	0
1 set of books and stationery for office, stores, and collectors	6	0	0
1 set machinery for grading and testing eggs	7	10	0
Acetylene gas plant...	10	10	0
20 boxes for collectors at 4s.	4	0	0
1 set of tools for box-making, &c.	1	1	0
1 set of stencils	1	10	0
	£77	11	0

There were also some expenses, amounting to about £20, for the repairing of the old houses and rendering them fit for the society's business, but from these figures it may be seen that the actual money required to start a poultry society is only about £100. It is also necessary, however, that there should be an additional sum of £200 or £300 in the hands of the committee for the purpose of carrying on the business, for the egg trade is done on a strictly cash basis. All eggs must be paid for when they are received, and when they are sold in England or in Scotland it takes nearly two weeks from the day on which they are purchased until the cash returns come in from the egg merchants who buy them. Therefore, if a society is handling £100 worth or £200 worth of eggs per week, as Dervock Society would be during the busy season from March to August, it would be necessary to have a sum of £200 to £400 in hand. This working capital is provided partly by the paid-up share capital and partly by a bank overdraft. All the Irish banking companies have now agreed to lend money to poultry societies at the rate of 4 per cent. per annum, calculated from day to day on the actual amount which the society has drawn out. This is a very great concession, for there was a time, not many years ago, when bankers charged co-operative societies a very high rate of interest, and were not always willing to lend them money on any terms.

A poultry society could make a fair start and carry on a successful business even on a smaller investment than £100,

provided that sufficient working capital for current expenses were available. It may be seen from the above table of figures that Dervock Society owns a horse, van and harness, and also has put in an acetylene gas plant. A society could do very well without these, although it is more economical to have them from the start. Horses can be hired to collect the eggs and to do other work, and Dervock Society employs three or four horses for these purposes. Considering the little night work which is done it is not absolutely necessary to have an up-to-date gas plant, and cheaper light might be provided, yet I strongly approve of the acetylene gas installation, as it is most useful for thoroughly testing the eggs. If the cost of these items were omitted, a poultry society could start business with an investment of £40 to £50, and very many of our societies have actually started with a smaller capital.

For the purpose of collecting all the eggs regularly and of ensuring perfect freshness the society's district has been subdivided into four smaller districts, and each of the four collectors employed has charge of one of these sub-districts. He is furnished, to start with, with a list of the names of all the members in his district, and he is bound to call on each of them at regular stated times. In winter time, when eggs are scarce, his visits are made once a week, but when the weather is warm, and eggs are in danger of becoming stale quickly, he makes his rounds two or three times a week. After a few weeks of this work, the collector knows his circuit very well and is personally acquainted with almost every member in it. He does not call on residents who are not members, nor has the society any dealings with them.

The collectors are instructed to buy only clean fresh eggs, and they must refuse any which are dirty or stale looking. They do not take a testing machine on their rounds, but with some practice they learn to know a fresh egg when they see it, and there is but little danger of their accepting any eggs which are below the standard quality required.

The eggs are bought by weight, and for this reason the collectors take a small weighing machine with them. They also take duplicate docket books and a supply of silver and copper money. They pay for the eggs as they are bought,

record the transaction in the docket book, and give each supplier a docket showing the weight and price of the eggs. The eggs are not counted at all. They are packed down carefully in large boxes, with a layer of straw between every two layers of eggs, and in this manner they are conveyed to the packing store. They are then unpacked and checked by weight. The docket books are made up, the cash in hand is counted, and by these

PURCHASE OF EGGS BY WEIGHT, BY ONE OF THE COLLECTORS EMPLOYED BY DERVOCK AND DISTRICT C.P.S.

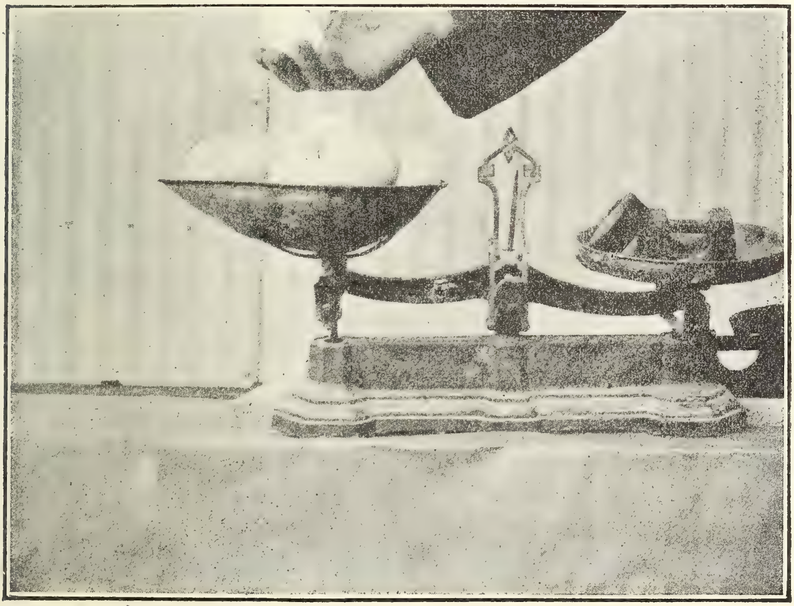
means the work done by the collectors is kept under the control of the manager.

When the eggs arrive at the store they are supposed to be in a sound, clean, and fresh condition, but it must not be taken for granted that they are so, and therefore they are carefully tested to see that the shells are sound and the contents quite fresh. This work is done by an expert, who uses a special testing machine lighted by four powerful jets of gas. Any eggs which are found to be musty or stale are destroyed and there is no more about them, but the proportion of loss is very small—not more than one to three per cent.

The eggs are next separated, according to weight, into several

regular sizes. At Dervock the selections are eggs weighing $13\frac{1}{2}$ lb. per 120, 15 lb. per 120, and 17 lb. per 120, and then they are sold by weight. The demand for large eggs is very great at all seasons, and the price which they realise is much higher than that received for the smaller grades. About Christmas, when eggs are at their dearest, 17-lb. eggs are worth about four shillings per 120 more than $13\frac{1}{2}$-lb. eggs.

The improved system of buying eggs by weight instead of by count, which has been introduced by the co-operative societies,



DUCK EGGS WEIGHING 21 LB. PER 120.

has since been largely adopted by other dealers, and there can be no doubt that it will have a more speedy and far-reaching effect in the improvement of the poultry industry of Ireland than any other reform which could be introduced. Practical poultry-keepers know that they can produce eggs of very fine size and quality by giving due attention to the breeding selection, care and management of poultry. It is worth while to do this when the result is an increased price for the eggs, and it does not cost any more to produce large eggs than it costs to produce small ones.

In support of this, I will give some figures showing the benefits of buying and selling eggs by weight. Of the eggs purchased by Dervock Society two years ago, 40 per cent. weighed 13½ lb. per 120; 40 per cent. weighed 15 lb. per 120; 20 per cent. weighed 17 lb. per 120, and there were no eggs capable of being graded as 18-lb. eggs.

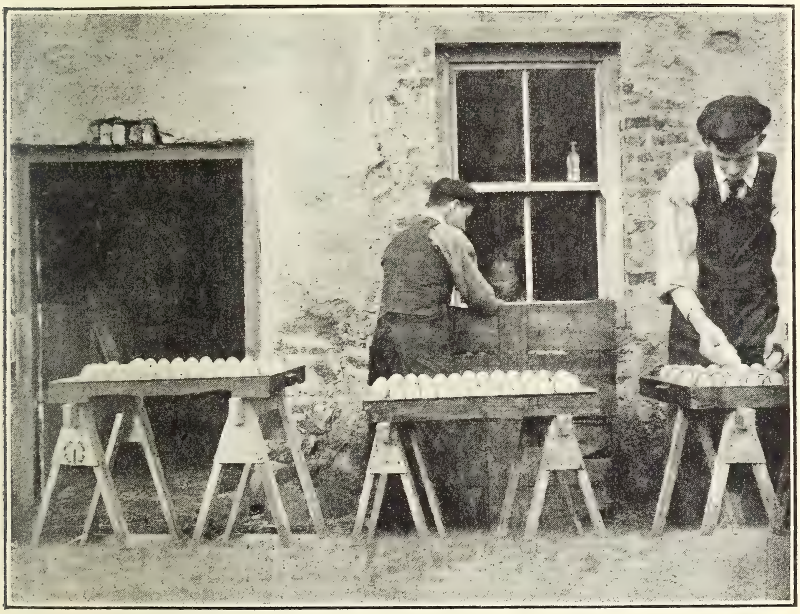
At the present time 10 per cent. weigh 13½ lb. per 120; 30 per cent. weigh 15 lb.; 30 per cent. weigh 16 lb.; 20 per cent. weigh 17 lb.; and 10 per cent. weigh 18 lb. per 120. This must be regarded as an extraordinary improvement considering the short period in which it has taken place. In cases where our societies have been working during four or five years the increase in weight of eggs is far greater, and a few quotations taken from the books of Mallow Poultry Society, co. Cork, will suffice to illustrate the benefits which accrue from the system of buying and selling eggs by weight:—Four years ago 50 per cent. weighed 13½ lb.; 30 per cent. weighed 15 lb.; and 20 per cent. weighed 17 lb. per 120. At the present time 30 per cent. weigh 14 lb.; 30 per cent. weigh 16 lb.; 20 per cent. weigh 17 lb.; and 20 per cent. weigh 18 lb. per 120.

It may be noted that Mallow Society, according to these figures, no longer grades any 13½-lb. eggs. The smallest are now 14 lb., and there are only 30 per cent. of these as compared with 50 per cent. of 13½ lb. four years ago. The 15-lb. selection has also dropped out, and its place has been taken by 16-lb. eggs, of which there are 30 per cent., or equal to the number of 15-lb. eggs received four years ago. Seventeen-pound eggs stand at 20 per cent., but a new selection has been introduced, namely, 18-lb. eggs, of which there are 20 per cent.

The grading of eggs is done in some cases by the sight and in others by the touch, and according as they are selected they are placed on the special trays shown in the illustrations These trays are made after a model lately introduced from Denmark. They are made of perforated mill-board of best quality, nailed on a frame of light deal. Each tray weighs 5 lb., and contains 120 perforations. When the eggs have been graded on to the trays, they are placed, six trays at a time on a scale, in order to see that they are neither over nor under the weight required. They can then be guaranteed as

of a certain weight and sold as such without any doubt or question.

The trays described are also used for testing the eggs. A square box lined with bright tin is fitted up in a dark corner of the packing store. Inside this box there are four jets of gas, and by placing the perforated tray filled with eggs on top of the box, all the light passes through the eggs. The man who is testing can then see if there are any cracked or stale eggs,



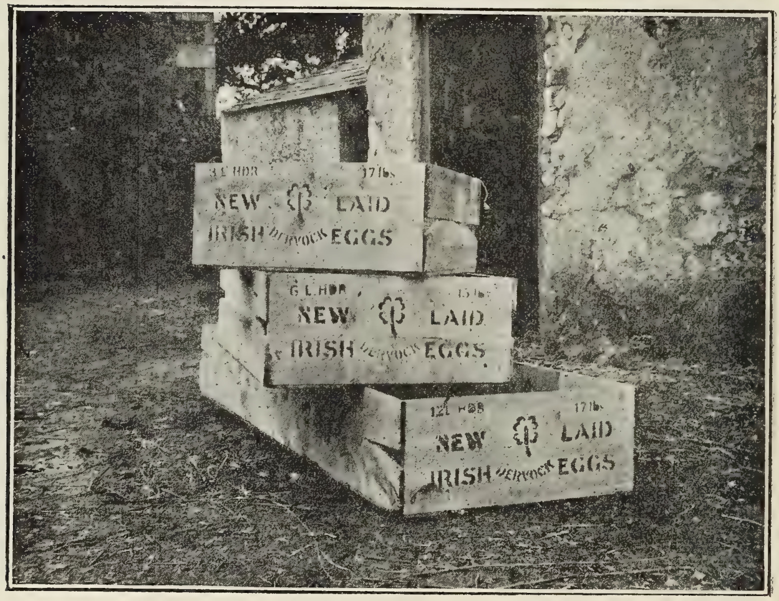
GRADING OF EGGS AT DERVOCK SOCIETY.
(When arranged in the grading trays shown the eggs are ready for testing.)

and the testing of 120 eggs, when they have been placed in the tray and held over the light, takes only half a minute. This is a very great improvement on the old system of holding the eggs up to a candle or lamp, three at a time, and testing them slowly and laboriously.

The eggs are now ready for packing in the cases, which are to convey them to one or other of the large towns or cities of Great Britain. Non-returnable cases are used, as required by the British trade, and they hold either three hundreds, six hundreds, or twelve hundreds of eggs each. A hundred of

eggs is 120, which is called "a long hundred." As the cases are required for only one journey, it is not necessary that they should be made of high-priced durable wood. On the contrary, the lightest and cheapest quality suits very well, and it is usually sawn by local saw mills from deal, poplar, lime, or some similar native timber.

It is most important that the cases should be accurately sawn, in order that they may be neither too large nor too small for



EGG-CASES IN COMMON USE—3 HUNDRED, 6 HUNDRED, AND 12 HUNDRED.
(These are non-returnable, and are made to hold for one journey only.)

the number of eggs they are required to hold. In the one case it would be necessary to use extra packing material, and in the other the eggs might get smashed for want of sufficient packing or on account of tight packing. The cases must be of different sizes, to suit the size of the eggs. For instance, a case which will be just the right size for twelve hundreds of $13\frac{1}{2}$-lb. eggs will not suit at all for twelve hundreds of 17-lb. eggs. The exact sizes which are most suitable for the eggs of various grades have been ascertained by experience, and the society

supplies the saw mill owner with a specification of the timber required, which is as follows :—

No. 1.—To contain twelve hundreds 17-lb., 18-lb., or duck's eggs.

	In.	In.	In.
Four end pieces	24 ×	10 ×	⅞
Two side pieces	80 ×	10 ×	⅜
Six top and bottom pieces ...	80 ×	8 ×	⅜

No. 2.—To contain twelve hundreds 13½-lb., 15-lb., or 16-lb. eggs.

	In.	In.	In.
Four end pieces	22 ×	9 ×	⅞
Two side pieces	76 ×	9 ×	⅜
Six top and bottom pieces ...	76 ×	7 ×	⅜

No. 3.—To contain six hundreds 17-lb., 18-lb., or duck's eggs.

	In.	In.	In.
Two end pieces	24 ×	10 ×	⅞
Two side pieces	40 ×	10 ×	⅜
Six top and bottom pieces ...	40 ×	8 ×	⅜

No. 4.—To contain six hundreds 13½-lb., 15-lb., or 16-lb.

	In.	In.	In.
Two end pieces	22 ×	9 ×	⅞
Two side pieces	38 ×	9 ×	⅜
Six top and bottom pieces ...	38 ×	7 ×	⅜

No. 5.—To contain three hundreds 17-lb., 18-lb., or duck's eggs.

	In.	In.	In.
Two end pieces	24 ×	10 ×	⅞
Two side pieces	24 ×	10 ×	⅜
Six top and bottom pieces ...	24 ×	8 ×	⅜

No. 6.—To contain three hundreds 13½-lb., 15-lb., or 16-lb.

	In.	In.	In.
Two end pieces	22 ×	9 ×	⅞
Two side pieces	23 ×	9 ×	⅜
Six top and bottom pieces ...	23 ×	7 ×	⅜

The timber is sawn into boards of these dimensions and sent to society's stores, where they are nailed together to form boxes and put into a shed to become seasoned and dry. The twelve-hundred cases are double the length of the six-hundred cases, and they contain two ends in the middle, as it were. Thus a twelve-hundred case is really two complete six-hundred cases, and the object of having it made in this form is that the buyer may divide it into six-hundreds if he wishes by sawing through the middle.

The packing material used consists of either wood fibre or perfectly dry oaten straw. When straw is used it is bought

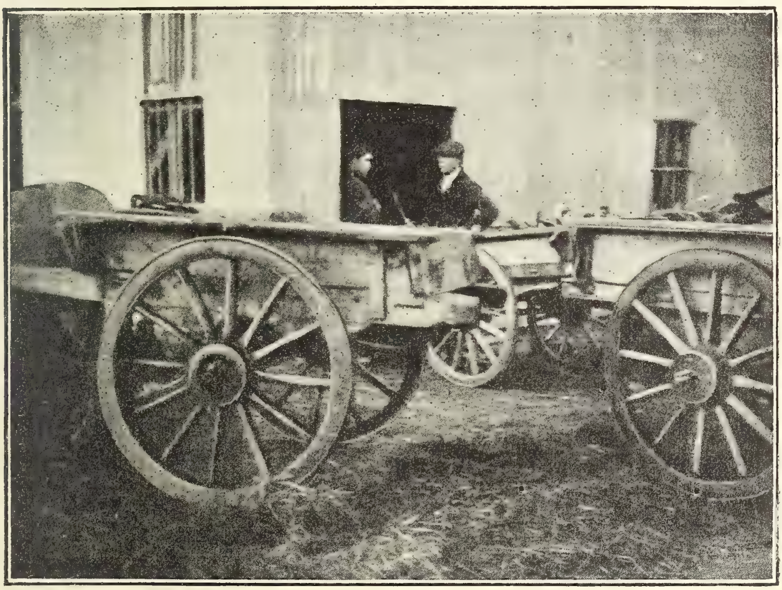
from some farmer in harvest-time and stored in a shed or loft, so that when required for use it may be quite dry and free from mustiness. This is of the utmost importance, because eggs would assume a musty flavour in a day or two if packed for transit in damp or musty straw. Wood fibre, or wood-wool as it is also called, is made by special machinery from soft woods, and is then dried and pressed into bales of 1 cwt. each. It is largely manufactured in Ireland, and the societies obtain it from Dublin, Belfast, or Cork. It is considered a cheaper packing material than straw, although it costs £5 per ton, when straw can be bought at £2 or £2 10s. This is because it goes farther than straw. Some merchants prefer straw packing, and others like wood-wool better, so that societies must stock both materials in order to please all their customers.

A case of eggs contains only one size or grade, and they are packed in four layers, with a layer of packing material on the bottom, another on the top, and one between every two layers of eggs. The lid is securely nailed down and marked on top as follows :—"Irish Eggs"; "With Care"; "This Side Up"; "Keep Dry." The ends of the cases are branded as shown in the illustration with the trade mark of the society, and with figures indicating the number and weight of the contents.

All the eggs are sold at net prices f.o.r. at the nearest station, and when the railway company takes them in hand the society has no further responsibility, and if there are breakages, delays, or any other mishaps, they are settled between the purchaser and the railway company.

So far as the egg department of a poultry society is concerned, success may be measured by the increase in the size and weight of the eggs, about which I have written above, and also by the improved price which the members realise as compared with the price which they could make when handling eggs by the old system. I have made particular note of the prices paid to members, and also of the prices obtained from the English buyers, and I am quite satisfied that a well-managed up-to-date society pays for eggs at the rate of at least two-pence per dozen above the price which used to obtain in the district before its establishment. The increase in price has been brought about by the immensely improved method of doing

business, and also by the cutting out of middlemen. It is a well-known fact that in the egg business there are far too many middlemen, and that by the time each one has had his quota of profit there is little or no profit left for the producer. Of course, we cannot do without middlemen who carry on a legitimate trade and retain only a fair profit, but it is a fact that half the eggs which are produced in Ireland pass through the



DELIVERY OF TURKEYS AT WINDGAP POULTRY SOCIETY, CO. KILKENNY.

hands of at least six middlemen from the time they leave the farmer's yard until they appear on the breakfast table of the consumer in Glasgow or London.

To the uninitiated it may seem that an increase of twopence per dozen is hardly worth talking about, but let us consider what it means to the poultry-keeper. A farmer keeps, say, 100 hens of a pure breed, such as the Leghorn or the Minorca, and of a good laying strain. He has them comfortably housed and sheltered, well fed, and cared for in an intelligent way. The annual yield from such a flock should be an average of 180 eggs per hen—that is, 15 dozens. Under the new system of marketing the eggs fetch twopence per dozen above what they used to

realise under the old plan Therefore for every hen the farmer keeps he makes half a crown per annum more than he was accustomed to make in years gone by; and that without any special breeding, feeding, or management, only because he is a member of a co-operative society.

I have written so much about the egg department of the societies that readers may assume that the chief function of a society is to trade in eggs, but although this is true of some few of the societies it is not true of the majority. With many of them the table poultry business is the chief department, but this is of too large and varied a nature to be dealt with within the limits of this article. I may say, however, that it includes the fattening of fowls by the newest and most profitable system, the fattening of turkeys, ducks, and geese, and the preparation and despatch of all these to markets.

Amongst the other functions of poultry societies there are two which are deserving of special mention, viz. (1), the improvement of the breeds of fowls and poultry of all kinds, which is effected by the importation of stock birds of good quality and the distribution of them at the lowest possible price amongst the members of the society; and (2), the distribution on the most favourable terms of poultry-keepers' requirements, which include incubators, portable fowl-houses, feeding troughs, &c., and also feeding stuffs, tonics, medicines, grit, &c., &c.

The Irish poultry industry undoubtedly faces a great future, and every intelligent person now admits its enormous importance. The time has passed when poultry-keeping was looked upon as something small and unimportant. The only things which hamper its higher development are the modes of transit and the high freights charged by the carrying companies. We have the advantage over foreign countries of nearness to the markets, mild climate, a plentiful supply of well-sheltered grass runs, and a rural population consisting largely of girls who are not too busily engaged and might very well employ their spare time in the rearing of poultry.

Considering the small capital required, poultry-keeping yields a greater profit than any other branch of agriculture or country industry, and it is likely to become one of the most profitable rural industries of this island. With even a very small

plot of land, anybody who keeps a poultry-yard intelligently and skilfully, can increase his income and solve many a difficulty in household economy.

Co-operation has already taught the farmers and cotters to place on the markets produce which in freshness, cleanliness, quality and general mode of treatment, is on a level with the best produce from other countries, and it has proved by demonstration that it is not quantity but quality which pleases customers, retains their custom and produces most money.

H. DE COURCY.

COST OF TRANSPORT FROM DENMARK TO GREAT BRITAIN.

The cost of transport of agricultural produce in Denmark and from Denmark to Great Britain forms the subject of one section of the Report on Rural Conditions in Denmark published by the Irish Department of Agriculture.

The railway systems of Denmark are practically all State-owned, and therefore a comparison is very difficult between the methods obtaining there with those in Ireland.

There are only two centres of collection and distribution for export, viz., Copenhagen and Esbjerg.

At Copenhagen, the produce for Scotland and parts of the North of England are collected, while at Esbjerg that for the Midlands and South are dealt with.

Seeing that the railways are mostly the property of the State, the staple products of the country are naturally dealt with as cheaply as possible, and in this way agriculture is encouraged at very little expense to other classes of industry.

The rates for butter, eggs, milk, cheese, cream, and bacon are low, being on a sliding scale for about every three statute miles. The cost per ton is as follows for every ten miles or so, but the intermediate distances are rated in proportion. If the waggon, however, is the property of the firm sending goods the rail-

way refunds them 1s. $1\frac{1}{4}$d. for every thirty-one miles (50 kilometres) the waggon travels.

For Distances up to	Small Lots, per ton.	Per Waggon-load of 5 Tons, per ton.
	s. d.	s. d.
10 Mile	2 $5\frac{1}{3}$	1 $6\frac{2}{3}$
20 ,, ...	3 $5\frac{1}{3}$	2 4
30 ,, ...	4 $5\frac{1}{3}$	3 $1\frac{1}{3}$
40 ,, ...	5 4	3 $9\frac{1}{3}$
50 ,, ...	6 3	4 $2\frac{2}{3}$
60 ,, ...	6 10	4 $10\frac{2}{3}$
70 ,, ...	7 6	5 $5\frac{1}{3}$
80 ,, ...	8 $1\frac{1}{3}$	5 $9\frac{2}{3}$
90 ,, ...	8 8	6 $1\frac{1}{3}$
100 ,, ...	9 4	6 $6\frac{2}{3}$
110 ,, ...	9 $9\frac{1}{3}$	6 $10\frac{2}{3}$
115 ,, ...	9 $10\frac{2}{3}$	7 0

The rates include the services of collection by cart within the carting radius, loading and unloading, and delivery, either from station to steamer or merchant's warehouse in Copenhagen. These rates are at owner's risk, and there are no other rates in force. Through rates to England are practically non-existent owing to the fact that most of the produce passes through the warehouses of local merchants; but through rates do, however, exist for bacon, *e.g.*, 27s. 6d. per ton from Odense to London, viâ Esbjerg, and 35s. to Manchester, viâ Grimsby and Esbjerg.

The following are examples of the rates for bacon per ton from Copenhagen, viâ Hull (distance, Copenhagen to Hull, 640 miles):—

	s.	d.	
To Stockport, Manchester, Salford--5-ton lots ...	31	0	per ton
,, Stockport, Manchester, Salford—small quantities	35	0	,,
,, Birkenhead and Liverpool—4-ton lots	29	2	,,
,, Birkenhead and Liverpool—small quantities ...	35	0	,,
,, Bristol	42	6	,,
,, Cardiff	45	0	,,
,, Birmingham	42	0	,,
,, Chester	40	0	,,
,, London (rail from Hull)	40	0	,,

From Copenhagen, viâ Leith (distance, Copenhagen to Leith, 580 miles):—

	s.	d.	
To Edinburgh	25	0	per ton
,, Dumfries	35	0	,,
,, Belfast	30	0	,,
,, Ardrossan	30	0	,,
,, Glasgow	20	0	,,
,, Inverness	42	0	,,

Butter rates from Copenhagen, viâ Newcastle-on-Tyne (distance from Copenhagen to Newcastle-on-Tyne, 586 miles):—

	s.	d.	
To Aberdeen	47	6	per ton
,, Bedford	55	0	,,
,, Belfast...	55	0	,,
,, Bradford	42	0	,,
,, Cardiff	60	0	,,
,, Dublin (viâ Liverpool)	55	0	,,
,, Dublin (viâ Silloth)	50	0	,,
,, London	50	0	,,
,, Manchester	47	0	,,

Butter rates from Copenhagen, viâ Leith :—

	s.	d.	
To Edinburgh	30	0	per ton
,, Dumfries	40	0	,,
,, Belfast	43	4	,,
,, Ardrossan	44	0	,,
,, Glasgow	30	0	,,
,, Inverness	50	0	,,

Butter rates from Copenhagen, viâ Hull :—

	s.	d.	
To Bath	66	6	per ton
,, Belfast	53	0	,,
,, Birkenhead	45	0	,,
,, Cardiff	60	0	,,
,, Dublin (viâ Liverpool)	55	0	,,
,, Edinburgh	50	0	,,
,, Glasgow	50	0	,,
,, London (rail from Hull)	50	0	,,
,, ,, (steamer from Hull)	35	0	,,
,, Manchester	47	0	,,
,, Hull	25	0	,,

Egg rates from Copenhagen, viâ Hull :—

	s.	d.	
To Birmingham	59	0	per ton
,, Cardiff	65	0	,,
,, Manchester	48	6	,,
,, Liverpool	47	6	,,
,, London	50	0	,,

Egg rates from Copenhagen, viâ Leith :—

	s.	d.	
To Edinburgh	45	0	per ton
,, Dumfries	45	0	,,
,, Belfast	45	0	,,
,, Ardrossan	45	0	,,
,, Glasgow	35	0	,,
,, Inverness	37	6	,,

There are six lines of steamers employed in carrying produce to Britain. Only one of these receives anything in the nature

of a subsidy, viz., the United Steamship Company, from Esbjerg to Parkstone (Harwich), and Esbjerg to Grimsby. This subsidy was given to the Steamship Company to put on three boats a week instead of two, on the Harwich route, although the traffic did not warrant the increase; but the object of the extra boat was to secure more frequent delivery from consignor to consumer. The total amount of the subsidy voted by the Danish Government for this extra boat amounts to 200,000 kroner, or £11,100 sterling, per annum. They have also voted £4,440 to run an extra boat per week from Esbjerg to Grimsby. A condition of the subsidy was refrigerating chambers on all the boats. It was understood that none of the boats carried a full cargo, and that without the subsidy the extra boat was unwarranted by the amount of traffic, and therefore would be run at a loss.

FARM LABOUR IN THE UNITED STATES.

The wages of farm labour in the United States formed the subject of an enquiry conducted by the Department of Agriculture in 1902, in continuation of similar investigations which have been conducted from time to time since the year 1866.

The total number of agricultural labourers in the United States, according to the Census of 1900, was 4,410,910, of whom 2,366,149 were members of the families of the farmers, leaving only 2,044,761 persons hired on farms outside the farm families, or less than one hired labourer for every alternate farm. The greater number of farmers in the country, therefore, do their own work with the aid of their families, with occasional assistance from neighbours. The tendency to special kinds of work and the disposition to do work by the job or piece, however, is evidently on the increase, and every year it becomes more difficult to give any correct view of farm wages in the form of tables. Ploughing and hoeing by the acre, gathering fruits, digging root crops, picking or husking maize and threshing grain by measure, cutting by the shock and harvesting by the

acre, are increasing practices, which involve great activity at their respective periods but leave long intervals unoccupied.

The monthly wages of farm labourers engaged for the year or season, without board, averaged for the country, as a whole, £4 12s. 3d. in 1902, as against £4 4s. 3d. in 1899 and £3 13s. 8d. in 1895; with board the payments were £3 8s. 4d. in 1902, £2 18s. 7d. in 1899, and £2 10s. 1d. in 1895. The day wages of ordinary farm labourers in 1902, without board, averaged 4s. 8½d. per day, and 3s. 8½d. per day with board; while in harvest time the average rate of payment was 6s. 4½d. and 5s. 7d. per day respectively. In consequence of the different descriptions of farming pursued in the United States, including as it does the great stock and grain farms of the West, the cotton, sugar and rice farms of the South, as well as dairy, vegetable and fruit farms, the variations in the wages prevailing in different States are very considerable.

One important factor in connection with farm wages, on which considerable emphasis is laid in this Bulletin, is the interrupted character of the employment. Farming that is limited to the production of local open field crops must, it is observed, have considerable periods of unoccupied time in the year, and in the Northern States there are three or four months of winter in which field work practically ceases; the possibility of cultivating a variety of crops is expanded as one goes southward, and dairying also modifies farm wages by providing occupation throughout the year. The one-crop farmer, however, whether raising wheat at the extreme North or on the Pacific coast, raising maize in the Upper Mississippi Valley or cotton, rice or sugar in the South, only needs helpers at special seasons, and the able-bodied industrious man desirous of continuously employing his whole time finds his energies limited by the conditions of ordinary farming. This variable period of activity on the farm, especially when contrasted with the greater steadiness of employment in various manufacturing, commercial or building enterprises, constitutes, it is thought, one of the greatest difficulties in procuring help upon the farm.

The conditions of labour in the different States are greatly affected by the inflow of foreigners, but the immigration does not seem directly to relieve the scarcity of farm labour, as many

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of the new-comers are absorbed by the works in progress in connection with railroads, waterworks and other large undertakings.

Hours of labour vary, but there is a general tendency in the vicinity of railways, shops and factories to regard ten hours as the working day, and it is becoming quite common to expect day hands to leave at the end of ten hours' work; monthly hands work longer, and "from sun to sun" is a frequent statement of the hours of farm labour from some part of almost every State. There is a somewhat general custom over the country to give dinner to day helpers and, in some cases, two meals.

A number of public holidays are observed, in addition to Sunday, and payment for these is a matter of adjustment. In certain States the irregularities of service caused by holidays and by idleness are so great that hiring for fixed periods has largely given way to hiring by the day, or if hiring for longer periods is retained deductions are made for all time lost.

GERMAN BOUNTIES ON AGRICULTURAL PRODUCTS.

A Report * recently issued by the Foreign Office on the bounties, other than those on shipping and navigation, paid by foreign Governments, contains an account of the advantages granted by the German Government in order to favour the exportation of grain, flour and other mill products.

From the year 1865 to 1879 corn was admitted duty free into Germany, but in the latter year a duty of 2s. 2d. per quarter was imposed. The effect of this duty was to render the trade of the smaller millers and corn merchants with foreign countries more difficult, on account of the greater money outlay required to pay the import duties when they brought wheat into the Empire; and that portion of the population engaged in various German industries was also affected by the higher home price of corn and its products. In order to alleviate somewhat these effects

* Commercial, No. 2 (1904). Cd. 1946. Price 6d.

and to afford assistance to the German millers for the exportation of flour, the German Government, in 1879, allowed the import duty to be refunded on all exported foreign grain and flour, as well as other mill products, such as pearl barley, groats, &c., which could be proved to have been imported from abroad, and to have been subsequently re-exported. For this purpose certificates of identity ("Identitätsnachweise") were required.

The next step was to grant, by the Law of 1882, the refund of the import duty on all exported mill products, whether produced from grain grown abroad or in Germany.

In 1887 a direct export bounty on corn was contemplated when the Stollberg motion was brought before the Reichstag for the payment of a sum equal in amount to the import duty on all exported wheat, without any distinction of origin whatever, whether from abroad or from German sources. This was not carried; but, by a Law of the 14th April, 1894, which is still in force, a new system was introduced. That Law abolished, as had already been done for flour, &c., in 1882, the former requirement of proving the identity of the re-exported with the imported grain by a certificate of identity.

This Law provided that when, on the exportation of wheat, rye, oats, barley, pulse, rape, and rape seed in quantities of not less than 500 kilog. (half a metric ton), Customs passes ("Einfuhrscheine," literally import certificates) should be granted which would entitle the owner to import, within the following six months, a corresponding amount of the same grains up to the value of the duties comprised in them. If this importation to a corresponding amount does not take place within the said six months, then the full amount of the duties have to be paid.

Owners of flour and malt mills, on exporting their products, can also obtain these Customs passes for an amount of duty-free grain corresponding to the amount of flour, &c., used in their exports manufactured out of foreign grain and pulse. No drawback is granted for mixed flours. It was also made permissible for such persons to utilise these Customs passes for payment of duties on certain Colonial imports—namely, on raw coffee, cocoa beans, rice, southern fruits, tea, petroleum, spices, salted herrings, olives, caviar, sea shellfish, oysters, fish oils, &c., for which articles up to 60 per cent. of the total duties leviable on

them could be so paid. They can also have these passes credited to their accounts in the Custom Houses at which they import. This so-called "Zollkonto" (Customs account) confers on them a "Zollkredit" (Customs credit) good for the space of five months. There is here, therefore, no actual bounty paid in cash; but, as these Customs passes are negotiable papers, they amount to much the same thing. There is always a strong demand for them, and they fetch a price only very slightly under the amount of the duty—namely, of nearly 35 marks per ton for wheat and rye, and similarly for other kinds of grain.

The whole system affords not only a kind of direct bounty to certain exporters, but also acts as an indirect one to some producers. The large millers, with the best modern milling machinery, are apparently specially favoured by it, inasmuch as they can obtain from the wheat they manufacture into flour, &c., a greater percentage than accords with the proportional yield, as fixed under the Law, of 75 per cent. of flour, for instance, from wheat. It is asserted that they can obtain up to a 93 per cent. yield; and, as the drawback is reckoned on the amount of wheat consumed, they are thus supposed to be able—from the fact of this excess yield over and above the fixed 75 per cent.—to claim (in spite of certain regulations to prevent it) a larger amount of duty-free imported wheat than they ought to have in return for the actual amount of wheat manufactured by them into flour. The exact amount of the bounty, therefore, rises according to the increased capacity of the particular mill to obtain the most flour out of a given quantity of wheat. The same reasoning may be applied, more or less, to other kinds of grain turned into mill products and then exported. The proportions fixed by the Law are: flour of wheat 75 per cent., of rye 65 per cent., and of barley and wheat mixed 75 per cent.; the proportion for malt is placed at 78 per cent.

On the introduction of the corn duties in 1879 it became necessary, in the interests of the transit trade and the exportation of corn, to make arrangements under which grain imported from abroad could, on re-exportation, be freed from the import duty paid on entry. Transit warehouses ("Transitläger")

were, therefore, established under Customs control in which grain could be stored until its destination was determined upon, either for foreign or German consumption. When the 1894 Law was passed, these transit warehouses lost their chief importance to dealers, in consequence of the identity of the grain having no longer to be maintained, as before, in order to obtain the benefits of the drawback. But, in spite of the efforts of the Agrarian Party to have them abolished, traders and millers have managed to keep them in existence for the distinct advantages which they afford. These consist mainly in their not having to pay the import duties, if eventually sold into the German Empire, for some three months, thus enabling them to work with a smaller capital than would otherwise be possible. After the passing of the 1894 Law, it was no longer necessary to have the transit warehouses for grain under special Customs control. They are now, however, under special regulations, and can only be established at places designated by the Bundesrath. They are called mixed warehouses ("Gemischte Transitläger"), from which the corn can issue either for export to foreign countries or into German territory.

From the point of view of the Agrarians, the special arrangements, sanctioned by the 1894 Law, are viewed with great disfavour. They object to their specially favouring the milling industries and the grain merchants, and they consider it to be injurious to German agriculture that this system should be allowed to further increase foreign imports of grain ; though, at the same time, they acknowledge that the exportation of grain from Eastern Germany has been assisted by the measure. As regards the advantages given to mill products, they condemn them as giving to the larger mill-owners, who mostly consume foreign grain, an undue predominance, harmful to the interests of the smaller, who chiefly use corn grown in Germany.

Both the systems of transit warehouses and Customs credits are denounced by them as equivalent to a grant of Government loans, without interest, to particular classes of the population, thus contributing largely to enable them to import foreign instead of buying home-grown corn.

It should be mentioned that it is also provided, under the Customs Laws, that all barrels, sacks, &c., imported for the purpose of containing grains, oils, &c., that are to be exported, are admitted duty-free. Similarly, such barrels, sacks, &c., as have been used for these purposes on exportation are readmitted free of duty on their return to Germany.

Manuring of Leguminous Crops.

The Essex Education Committee have carried out a series of experiments on the manuring of beans, peas and clover, and where practicable, the fields have been kept under observation in order to test the after-effects of the manurial treatment on the succeeding crops. In the case of a rotation beginning with a leguminous crop the after-effect of the manures applied for the first crop is not simply a question of manure residues, but is complicated by the fact that owing to the power of these crops to absorb atmospheric nitrogen, the soil is left rich in combined nitrogen, which the succeeding crops are able to utilise. The manures applied to the beans and the produce per acre from the rotation crops in this experiment are shown below :—

Manure per Acre.	Produce per Acre.			
	Beans.	Wheat.	Barley.	Clover hay.
	Bush.	Bush.	Bush.	Cwt.
Dung, 12 tons; superphosphate, 3 cwt.	37·9	43·7	30·4	45·7
Dung, 12 tons	34·9	41·1	29·1	39·7
No manure	29·9	36·0	26·2	38·0
Basic slag, 4 cwt.	31·5	38·4	28·0	44·2
Superphosphate, 4 cwt.... ...	34·4	39·7	27·8	40·4
Superphosphate, 4 cwt.; sulphate of ammonia, 1 cwt. ...	30·5	39·7	29·0	40·5
Superphosphate, 4 cwt.; sulphate of ammonia, 1 cwt.; kainit, 1 cwt.	32·8	38·8	27·6	43·4

The most striking feature is the long-lasting action of the manures applied for beans. The after-effect of superphosphate when used along with farmyard manure is especially remarkable, and this is partly due to its own unexhausted residue remaining available in the soil for the succeeding crops, as well as to its indirect effect in producing more beans and thus enriching the soil with nitrogen. Another feature of the table is the comparative action of superphosphate and basic slag: the former is quick in its action, but sooner exhausted, while the latter only becomes gradually available and reaches its greatest activity on the clover in the fourth year of the experiment.

Use of Rye Grass in Seed Mixtures.

An experiment in laying down land in grass for three years has been undertaken by the Edinburgh and East of Scotland College of Agriculture at the request of the Fifeshire County Council. The experiment arose from the fact that in certain parts of the country it is often desirable to extend the rotation of crops on second and third rate land by allowing it to remain in grass for a longer period than one or two years. When this is successfully accomplished the labour bill is reduced, the fertility of the land is increased by the accumulation of vegetable matter, and better crops are obtained at less expense; but it often happens that, although the grass yields a satisfactory crop the first year, in the second and subsequent years it deteriorates considerably. There is some reason for believing that the failure of these lands to carry grass longer is, to a certain extent, due to the unsuitability of the mixtures of seeds used. These mixtures generally consist of a heavy seeding of rye grass along with from seven to ten pounds of clover. A few pounds of "natural" or permanent grasses, such as cocksfoot, timothy and meadow fescue, may form part of the mixture, but owing to the heavy seeding of rye grass neither these grasses nor the clovers make much headway, and the vigorous growing shallow-rooted rye grass soon exhausts the resources of inferior soils, hence their inability to carry grass profitably.

The result of the first year's trial appeared to show that the quantity of rye grass in the mixtures of seeds in common use may be considerably reduced with advantage. The clovers, moreover, were most in evidence where the rye grass had either been used in moderation or not at all. In fact, the amount of clover increased as the rye grass decreased in the seeding; thus at one centre where the mixture ordinarily used by the farmer contained 41 lb. perennial rye grass, 6 lb. Italian rye grass, 9 lb. of clover, and 9 lb. of other seeds per acre, very little of the clover appeared in the hay crop; whereas, in the case of three other mixtures, containing each only 5 lb. of clover, it came up much more plentifully in the crop and increased as the seeding of rye grass decreased. Although this aspect of the experiments is still under observation, the results already obtained pretty clearly indicate that overseeding with rye grass is a very important factor in preventing the growth and development of clover.

In this connection reference may be made to some experiments* conducted by the Durham College of Science at Whitehall, Cumberland where it was found that perennial rye grass did not prove a lasting plant for pasture. Two plots sown in 1896 with the largest proportion of this grass were in 1902 the thinnest pasture; one of them sown with 32 lb. of rye grass and $7\frac{1}{2}$ lb. of clover was mainly dogstail and Yorkshire fog; it grazed badly, and its inferiority was very marked. On all the plots the proportion of rye grass was less than that originally sown. Cocksfoot, on the other hand, was present in very much greater proportion than it was sown in, except where sown with the larger amounts of rye grass, which tended to check its development.

German Harvest of 1903.

Particulars of the acreage and crops in Prussia in 1903 were given in this *Journal* in December last (Vol. X., p. 408) in advance of the complete

* *Board of Agriculture: Report on the Distribution of Grants for Agricultural Education*, 1902-3, p. 87.

returns for the whole of Germany. These have now been published and are given in the following table:—

Crop.	Area.		Production.	
	1902.	1903.	1902.	1903.
	Acres.	Acres.	Cwt.	Cwt.
Wheat	4,723,171	4,464,463	76,754,221	69,958,581
Spelt	769,793	740,590	9,507,131	8,815,646
Rye	15,201,726	14,851,658	186,831,309	194,906,273
Barley	4,060,742	4,200,218	61,008,038	65,404,467
Oats	10,266,036	10,597,283	146,944,812	154,936,969
			Tons.	Tons.
Potatoes	8,004,225	7,996,768	42,763,890	42,212,041
Clover	4,753,740	4,653,749	9,493,989	9,571,644
Lucerne	559,497	558,195	1,320,061	1,302,661
Hay	14,695,347	14,631,924	25,598,951	25,931,464

Crops in New Zealand.

A supplement to the *New Zealand Gazette* of February 18th, 1904, contains the complete returns of the areas under corn and green crops and of grasses, &c., in New Zealand on 15th October, 1903. The area of wheat sown for grain is returned as 230,346 acres as against 194,355 acres in the preceding year, and of oats 409,390 acres as compared with 483,659 acres in 1902. There were in addition 613 acres of wheat and 211,408 acres of oats sown for feeding, ensilage, &c. The area of grass land in the country amounts to over 34½ million acres, made up of 4½ million acres of ploughed land sown with grass and clover, 7,300,000 acres of surface sown grasses, and of 22,877,000 acres of native and tussock grass.

Crops in the North-West Territories.

The Department of Agriculture of the North-West Territories of Canada have published the following statistics of the principal grain crops for the year 1903, compiled from returns made to the Department by threshing machine operators:—

Crop.	Area.		Production.	
	1903.	1902.	1903.	1902.
	Acres.	Acres.	Bushels.	Bushels.
Spring Wheat	837,234	625,758	16,029,149	13,956,850
Fall Wheat	3,440	—	82,420	—
Oats	440,662	310,367	14,179,705	10,661,295
Barley	69,667	36,445	1,741,209	870,417
Flax	32,431	17,067	292,853	158,185

The average yield per acre of spring wheat in the Territories over a period of six years has been 19·42 bushels, and the production last year was very slightly below this figure. For barley the six-year average was 25·36 bushels and for oats 34·32 bushels per acre.

Bounties on Flax and Hemp in France.

In order to encourage the cultivation of flax and hemp in France, bounties based on the area cultivated have been paid since 1892. The sum allotted annually for this purpose has been 2,500,000 francs (£100,000), the rate of bounty being fixed by the Ministry. From 1893 to 1898 no bounty was paid unless the surface cultivated was one-tenth of an hectare (about one-fourth of an acre), but in the latter year the minimum was reduced to 8 ares (956 square yards). The amount of the bounty has varied from year to year; in 1898 it was 95 francs per hectare (30s. 9d. per acre) and in 1903 it only amounted to 66 francs per hectare (21s. 4d. per acre).

By a law dated March 31st, 1904, the subsidy of 2,500,000

francs is to be continued for a further period of six years, but the bounty allowed is not to exceed 60 francs per hectare (19s. 5d. per acre).

A Flour Beetle. (*Tribolium confusum.* L.)*

This tiny beetle, though not a true native of Britain, has been imported with its close ally *T. ferrugineum* in flour or cereal products, and is now widely distributed in this country, and under cover in suitable temperatures it breeds freely. *Tribolium confusum*, L., is flat, red brown in colour, and measures about one-sixth of an inch. A diagnostic feature is that the joints of the antennæ (examined with a good lens) increase gradually in size towards the tip. The beetles lay their eggs on and in the neighbourhood of the flour, meal or other cereal product, and from these six-legged, whitish, hairy grubs are hatched. The grubs while feeding and growing moult several times before passing into the resting pupal condition; the light coloured pupa gradually darkens into the adult beetle. In a favourable temperature there can be a number of broods in the year, so that infested material may very rapidly become worse. In addition to the nuisance of the presence of the beetles in various stages of development, the flour gives off a disagreeable odour.

Remedial Measures.

There is nothing which equals in effectiveness bisulphide of carbon. For a barrel of flour five ounces of bisulphide of carbon would do, the barrel to be kept as airtight as possible during the treatment. The mode of procedure is to pour the bisulphide of carbon into a shallow dish or saucer, which is placed on the top of the flour and the lid of the barrel closed. The fumes of the bisulphide of carbon being heavier than air sink through

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* Previous notices relating to insects injurious to grain and flour in stores have appeared in the *Journal*, Vol. II., June, 1895, pp. 28—37 ("Flour Moth, *Ephestia Kühniella*"; "Grain Weevils"; "Corn Beetle, *Læmophlæus ferrugineus*"). Vol. III., December, 1896, p. 280 ("Corn Moth, *Sitotroga cerealella*"). Vol. VIII., December, 1901 p. 358 ("Corn Weevils, *Calandra Granaria*").

the flour and cause the death of the pests. The barrel should be kept closed for two days, and if the beetles have been very numerous the treatment should be repeated. The flour is not harmed by exposure to the fumes.

In order to disinfect a store or mill, the building should be made as airtight as possible, and bisulphide of carbon, in the proportion of one pint for every 1,000 feet of cubic space, should be placed in soup plates or similar shallow vessels.

The operators must not for any length of time continue to breathe the fumes of bisulphide of carbon, nor must any light (not even the lit end of a cigar or a lighted pipe) be brought near. Owing to the heavy character of the vapour it will flow down from one level to another, and thus although being used away from fire it may flow down and come into contact with it with serious results. Hence the work of eradication should be started during the day time, so that no artificial light is required. As the fumes are heavier than air, if the building being fumigated consists of more than one storey the work should be begun on the lowest and proceed upwards. The mill or store should then be locked and kept locked for some days (Saturday to Monday) when the place can be ventilated; the disagreeable odour soon disappearing. An additional useful measure would be to spray the bisulphide into crevices or over machines likely to harbour the pests, and plugs of cotton wool steeped in the bisulphide of carbon might be pressed into spouts and crevices.

Navel Ill, Joint Ill or Big Joint in Lincolnshire.

The attention of the Board of Agriculture has been recently drawn to an outbreak of disease among lambs of a very fatal character which has appeared in Lincolnshire, the nature and cause of which did not appear to be understood locally. At the request of those interested one of the Veterinary Inspectors of the Board visited the infected farms and found that the disease which had caused serious losses in the district was one which is by no means uncommon, and is

generally known under the names of *Navel Ill*, *Joint Ill*, and locally as *Big Joint.*

Navel or Joint Ill is a disease which is of a fatal character not only to lambs but also calves, and appears shortly after the birth of the animals. Outbreaks of the disease also occasionally occur among foals, the joints being the chief seat of disease. Some years ago it caused the death of many thoroughbred foals at the Royal Paddocks at Hampton Court, and outbreaks have been recorded on the Continent in which considerable losses have occurred among this class of animal. The disease is one which can only be successfully dealt with by the practice of strict cleanliness on the part of the shepherd or other person in charge of the animals, combined with a system of antiseptic treatment of the navel cord shortly after birth.

The following copy of a report by the Veterinary Inspector who had charge of the enquiry should enable the stock-owner to recognise the disease.

The lambs are born vigorous and healthy, but within a few days their sprightliness disappears, and stiffness of the joints becomes apparent, followed by the formation of abscesses on almost all the joints, in the lymphatic glands, and frequently on the lips and muzzle. The position of the abscesses in the latter case is important, as the pus from them infects the udders of the ewes. The ewes show similar symptoms. From their method of infection the udder is the seat of pus formation, as are also the lymphatic glands at the back of the udder. Death is caused by exhaustion or blood-poisoning, the liver usually containing a number of small abscesses. On post-mortem examination pus formation is found in almost every part of the body, all the membranes surrounding the joints are more or less affected, and hardly a lymphatic gland can be found which does not contain pus, and quantities of pus also accumulate in the covering of the heart.

The sheep-breeding customs of the districts where the disease has appeared tend to its spread and continuance.

As a rule, big flocks of breeding ewes are kept, and these are lambed down in a yard divided by hurdles into pens, each to hold one ewe. In one case as many as 400 ewes lambed in one

lambing yard. Some farmers choose a different site each year, but others lamb down year after year on the same spot. The shepherds, although practical men, have little notion of antiseptic conditions; for example, the dead lambs are the shepherd's perquisite, and in many cases the shepherd skins the lambs himself; in so skinning he cuts into the abscesses of lambs that have died of this disease, and with hands covered with germs he may help a ewe to lamb or assist a newly-born lamb on to its feet. In such a case, by putting his hand under the lamb's belly, he places his infected hand directly on the open navel. On one farm a manure heap stood in the middle of the lambing pens, and a score of skinned lambs were lying on it in all stages of putrefaction. The shepherds are also in the habit of opening the abscesses with their knives, and letting the contents fall on the ground, which is often the floor of the lambing yard; it will be easily imagined how saturated the ground becomes when this has been going on year after year.

When a lamb has died of Big Joint it has been the custom to take one lamb from a ewe that has twins and foster it on to the ewe that has lost her lamb. The result is that the second lamb dies in consequence of the ewe's udder having been infected by the first lamb. When it is desired to get a ewe to foster-mother another lamb when her own has died, the shepherd often skins the dead lamb, and ties the skin on to the substituted lamb. There is no harm in this being done when the skinned lamb has not died of an infectious disease, but in this district the risk is too great.

It is not probable that any preventive measures will entirely eradicate this disease from this district, but the following recommendations would, it is believed, do much to prevent losses from this cause.

1. The large flocks should be sub-divided for lambing purposes. Instead of one large lambing yard three or four smaller yards should be provided; if the disease appears in one of these smaller yards it may be prevented from spreading to the others if all intercourse between the diseased yard and the others is stopped. The sites may be chosen as near the house as possible, but on fresh ground each year; a site once used should rest for several years.

2. At the end of the lambing season the straw should be stripped from the hurdles and spread with the floor litter over the yard and burnt. If for any reason this cannot be done the litter and straw should be mixed with lime and soil and made into a compost, which, however, should be used on arable land and not on pasture. The hurdles should be thoroughly scraped and washed with lime wash, to which 5 per cent. of carbolic acid has been added, before they are used for other sheep.

3. As each lamb is born its navel should be dressed with some antiseptic and astringent lotion of diluted carbolic acid or ointment. This would kill any germs, and also cause a slight swelling which would hasten the closing in the navel.

4. It is the custom in this district to trim the tail of the sheep and hind legs after lambing. This might be done with advantage before lambing, for the long wool is matted with fæces and mud, and harbours germs which are a constant danger to the lamb when it is in contact with it during parturition. It may be thought that if this wool is clipped before lambing the ewe will catch cold, but if it is trimmed a week before lambing, as is done in the majority of counties, the ewe is far less likely to catch cold than if she is trimmed and turned out immediately after lambing. There is no necessity to throw the ewe to do this; one man can hold her head while another trims.

5. Shepherds, in addition to ordinary washing with soap and water, should be careful to disinfect their hands after difficult cases, especially after handling a ewe with a dead lamb inside her, or one which has any discharge. Shepherds' hands and nails should be carefully washed, brushed with a disinfectant solution, such as 1 part of carbolic acid to 20 parts of water.

6. Dead lambs should be buried or burnt, or taken away whole without being skinned. If dead ewes must be skinned, they should be skinned by someone who has nothing to do with the healthy flock. Dogs should not be allowed to eat dead ewes or lambs, as they may be the harbourers of various parasites.

7. Lambing cords, india-rubber feeding nozzles, and sheep halters should be boiled or disinfected occasionally during the season.

8. If disease appears in a flock all efforts must be used to prevent its spread, and when any abnormal number of lambs die the services of a veterinary surgeon should be obtained. It is, however, doubtful whether it is any economy to doctor diseased lambs, as probably only 10 per cent. of them will ever grow into profitable sheep. The remedial measures, however, which may be adopted are described below.

(*a*) As soon as a lamb shows the premonitory symptoms of this disease, it should be taken to a special, well-sheltered hospital pen, where it should be brought up on the bottle and tended by a man who has nothing to do with the healthy flock. This would be practicable when a reasonable number of lambs were affected.

(*b*) When a lamb is thus taken into hospital, the ewe should be placed in a field with other lambless ewes. They should be milked occasionally and gradually dried off. At the time of weaning their udders should be examined, as it may be found that one half of the udder, or both halves, may be hard, and useless for breeding purposes. In no case should a ewe be given another lamb to bring up if her own has died of Big Joint.

(*c*) In treating lambs, the superficial abscesses might be opened by the shepherd and their pustular contents dropped into a pail of strong carbolic acid; in no case should it be dropped on to the ground. The abscesses should be syringed with a disinfectant.

The predisposing cause of this disease in this county is the system of using one lambing yard for the whole of the flock, and its consequent overstocking. Contagious abortion is also prevalent, which is another argument in favour of keeping the ewes in smaller flocks.

Weekly Return of Market Prices.

The Board of Agriculture and Fisheries have now completed arrangements for the collection and publication of returns of prices of live stock, meat, provisions, fruit, vegetables, hay and straw at the following 35 towns in Great Britain:—Ashford, Birmingham, Bristol, Carlisle, Chichester, Crewe, Darlington, Derby, Dorchester, Exeter, Ipswich, Leeds,

Leicester, Lincoln, Liverpool, London, Manchester and Salford, Newport (Mon.), Norwich, Penzance, Peterborough, Shrewsbury, Truro, Wakefield, York ; Aberdeen, Castle Douglas, Dundee, Edinburgh, Falkirk, Glasgow, Inverness, Lanark, Perth, Stirling.

For the collection of the returns the Board have appointed, at each of these towns, official reporters, who attend all the markets. The prices quoted are founded on personal observation and enquiry, and represent, in the judgment of the Board's reporters, the fair average market prices of the classes of animals and commodities sold during the week. They are based on actual wholesale transactions, nominal quotations at which no business is done being as far as possible excluded.

In these returns, both for fat and lean stock, the various breeds of cattle, sheep and swine, and, in the case of store stock, the ages of the animals, are distinguished. The prices of English and foreign meat are given separately. Provisions include butter, cheese, bacon, hams, and eggs, the origin again being distinguished ; the fruit and vegetables for which quotations are given vary according to the season.

The return, which is prefaced by a brief summary of the chief features of the week's business, is published every Wednesday, the quotations referring to the markets held during the week ending on the previous Saturday. It may be obtained, price 1d. weekly, from Messrs. Eyre & Spottiswoode, East Harding Street, Fleet Street, E.C. ; Oliver & Boyd, Edinburgh ; or E. Ponsonby, Dublin, either directly, or through any bookseller.

The publishers are also prepared to forward the returns regularly as issued, post free, on receipt of subscriptions for three, six, or twelve months, at the rate of 6s. 6d. per annum.

Board of Agriculture and Fisheries.—Report on Proceedings under the Tithe, Copyhold, Inclosure and other Acts for 1903. [*Cd.* 2005.] *Price 3d.*

This publication contains the separate Reports which are required under the provisions of various statutes to be laid annually before Parliament by the Board.

In the Report presented for the year 1902, occasion was taken

to supplement the annual statutory record by a general account of the nature of the business arising, and of the facilities offered to the public, under the Acts above referred to, together with a description of the method of administration pursued by the Department. The statutory functions of the Board in relation to Tithe Rent-charge and Corn Rents, Copyholds, Commons, Exchange of Lands, Improvement of Land, Land Drainage, Sale of Glebe Land, Universities and College Estates, Agricultural Holdings, Light Railways, and sundry minor subjects, were on that occasion fully set out in the summary memorandum prepared by the Legal Adviser of the Board. Specific information as to the forms of procedure prescribed for making use of the Board's intervention in these matters was also provided by reprinting the more important of the instructions which have been prepared for expediting the orderly transaction of the necessary business under each head. The information given in the volume referred to* remains at the disposal of those interested in this section of the work of the Board. The present Report is confined for the most part to a record of the business transacted during the year 1903, with serial tables showing the progress made under each head in previous years.

The number of applications under the Tithe Acts during the year was 1,140, and under the Copyhold Act, 1894, was 351, figures which were in each case in excess of those of the preceding year.

The Board gave further consideration to the proposal laid before them for the regulation, under the Commons Act, 1876, of the Merrow Downs, near Guildford, while a fresh proposal for the regulation of Oxshott Heath, in the county of Surrey, also claimed their attention. After local inquiries draft Provisional Orders were framed in both instances, and the necessary consents having been given the Orders were sealed, and will be submitted to Parliament for confirmation.

The award in the matter of the inclosure of the open fields and the heath and wastes in the parish of Sutton, in the county of Northampton, authorised by Parliament in 1901, was confirmed by the Board. Under this award five acres were allotted for a recreation ground and six acres for field-gardens, all good

* Cd. 1519. Price 8d.

land close to the village, and a new public road was set out and made to connect Sutton with the road to Southorpe and Stamford.

A number of schemes under Part I. of the Commons Act, 1899, for the regulation and management of commons with a view to their conservation as open spaces, were approved, and two schemes under the Metropolitan Commons Acts relating respectively to Farnborough Commons in the county of Kent, and to Norman's or No Man's Land at East Hillingdon in the county of Middlesex, were also approved and certified by the Board in 1903.

List of Orchids Cultivated at Kew.

The collection of orchids cultivated at the Royal Botanic Gardens, Kew, is essentially different from any, at least in this country, in the possession of a private collector, and perhaps its only serious rival is that of the Royal Botanic Gardens Glasnevin. Its main object is botanical, and to represent the family *Orchidæ* in as comprehensive a way as possible. The catalogue of the collection, of which a second edition has just been published (price 1s.), gives a list of the varieties which are of botanical interest, and is prefaced by an introduction which sketches briefly the progress which has been made in the art of growing orchids under artificial conditions at Kew since their introduction into this country.

The Agricultural Organisation Society.

The success which has attended the work of the Agricultural Organisation Society and of the co-operative associations connected with it have been referred to in previous numbers of this *Journal*.* The Board have now received a copy of the third annual report of this society for the year ending December 31st, 1903, from which it appears

* *Journal*, Vol. IX., June, 1902, p. 33. Vol. IX., December, 1902, p. 324. The article in the *Journal*, June, 1902, entitled "Farmers' Co-operative Societies," has been reprinted as a leaflet (No. 97).

that the number of affiliated societies increased during the year from forty to seventy-three, of which forty-seven were co-operative agricultural societies, nine dairy societies, nine village credit societies, four allotment and four miscellaneous societies.

The movement has spread into six new counties, making eighteen counties in all. Though many of these societies have only been registered within the past six months, others are already being organised at the desire of farmers resident in the surrounding districts.

The number of societies for the supply of agricultural requirements and sale of produce has largely increased, and the development of the older societies is reported to be most satisfactory. Co-operation in the purchase and testing of manures and feeding stuffs* forms an important part of their work, and the following extract from a report of the Brandsby Dairy and Trading Association, Limited (Yorkshire), may be quoted as describing the benefits obtained by farmers combining for this purpose :—

"We only charge a small profit on feeding stuffs to cover working expenses, cost of analysis, &c., therefore our members get considerable advantage, more especially the smaller men who may only require a few hundredweights at a time, as by combining the orders we get the lowest rate of carriage. We are also able to be of advantage to even the largest consumers, who do not now require to take such large quantities in order to save carriage. Consequently, they are able to have their cakes always fresh and in good feeding condition. Analyses are made from time to time, and as one analysis answers for all members who have had part of the consignment, they are able to know what they are getting, at no cost to themselves, this being covered by the small profit charged. . . . . We were able to get the railway company to give us storage facilities for cake, coal, &c., so that members when delivering farm produce at the station may load back, and this is of considerable advantage."

Among the dairy and bottled milk societies may be mentioned the Newark Dairy, Ltd., which is situated at Long Bennington. The amount of milk dealt with in eleven months of 1903 was about 12,000 gallons, and the price during six months October–March was 8d. per 10 lb., and for the remainder of the year 7d. The milk is sold in bottles at 4d. per reputed quart, and before being bottled is thoroughly cleansed and afterwards pasteurised. The secretary of this society mentions two advantages derived from the dairy by its members: (1) "It enables suppliers to secure an enhanced price for their milk to the former alternative

* *Journal*, Vol. X., June, 1903, p. 27.

of making it into butter, which was far from being remunerative; and (2) the money for milk supplied, coming in bulk monthly, does more good than the same amount in driblets, as it would come if the milk were sold retail." Another society supplying bottled milk is the Vicar's Farm, Limited,* in the Far Forest district of Worcestershire. The demand is now greater than the dairy, with its present plant, can supply, and the erection of new premises is contemplated. The industry has become of considerable benefit to the small holders of the district, who find that it offers the best method of selling their milk. The price paid was 7½d. per gallon (by weight) from January–June 6th; 6½d. from June 7th to September 30th; and 8d. during the rest of the year. The quantity of milk dealt with was 13,500 gallons.

The agricultural co-operative movement in Wales appears to be making substantial progress. All the societies, with one exception, have for their primary object the saving of the middleman's profit in the purchase of agricultural requirements. In the early part of the year a federation of the existing societies in South Wales took place, with the object of ordering the requirements of the federated societies in bulk and advertising for tenders. The first contract made was for 1,500 to 2,000 tons of basic slag, and the price paid was 15 per cent. below the lowest trade quotations. Another contract has been entered into for the supply of 1,500 tons of mineral superphosphate.

Among the general work of the Agricultural Organisation Society during the year may be mentioned the special authority obtained from the Treasury extending the provisions of Sections 33 and 35 of the Friendly Societies Act, 1896, to agricultural credit societies. Representations were also made by the Society to the Home Secretary as to the disadvantages under which creameries in Great Britain laboured in contrast with Irish creameries, with the result that the special exemptions granted to creameries in Ireland as regards the employment of women on Sundays were extended to the United Kingdom.

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* *Journal*, Vol. IX., Dec. 1902, p. 328.

Report on Co-operative Agriculture and Rural Conditions in Denmark, by Members of a Deputation from the Irish Department of Agriculture. [*Bulletin No. 7. Miscellaneous Series.*]

In a prefatory note to this Report it is observed that Denmark is, of all Continental countries, the most akin to Ireland in its general economic position. In the dairying industry, it is its keenest and most successful rival in the markets of the United Kingdom. It is consequently of interest to learn the views of men, who, knowing the agricultural situation in Ireland, have studied Danish methods on the spot, in the hope of arriving at the chief causes of her continuous and growing prosperity. How far these causes, supposing them to have been accurately diagnosed, can be made to operate in Ireland to the betterment of Irish agriculture is the problem before the Department and the country. This question of the application of Continental experience to the solution of Irish problems is one of difficulty and complexity, and requires much prudence and judgment. In a sense, it is true that the economic problem of each country is unique, and must be worked out on national lines by the people themselves, who are in direct touch with their advantages and their drawbacks. On the other hand, it is the part of wisdom—especially in these days of the world-market—to observe the methods of successful competitors.

The main object of the deputation sent by the Irish Department of Agriculture was to inquire into the bacon-curing industry of Denmark, and to endeavour to find out what methods had been followed by the Danish farmers and merchants in successfully establishing co-operative bacon factories with an ever increasing trade.

In inquiring into this subject many other matters of great interest came under their observation, particularly in relation to the dairying industry, people's high schools, egg-packing centres, land tenure, and organisation affecting the management of proprietary holdings, and these subjects are exhaustively dealt with in their Report.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of April, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 7	7 1	35 2	32 10
Herefords	7 6	7 0	—	—
Shorthorns	7 5	6 11	34 3	32 0
Devons	7 9	7 3	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	9	8¼	8½	7
Sheep :—				
Downs	8¾	8¼	9	8¼
Longwools	8¼	7½	8¾	7½
Cheviots	9¼	8½	9½	8¼
Blackfaced	9	8¼	8¾	7¾
Cross-breds	8¾	8	9½	8½
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	5 7	5 2	5 10	5 1
Porkers	6 1	5 9	6 5	5 8
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
In Milk	19 14	17 4	19 7	15 16
Calvers	18 8	16 0	19 2	15 3
Calves for Rearing	2 5	1 15	2 6	1 13
Store Cattle :—				
Shorthorns—Yearlings ...	8 14	7 7	9 11	8 3
,, Two-year-olds	13 1	11 3	14 3	12 0
,, Three-year-olds	15 19	13 16	—	13 10
Store Sheep :—				
Downs or Longwools— Hoggs, Hoggets, Tegs and Lambs	s. d. 45 0	s. d. 39 6	s. d. —	s. d. —
Scotch Half-breds ,, ...	33 0	27 0	37 6	32 0
Store Pigs :—				
Under 3 months	18 0	14 6	23 6	16 6
Over 3 months	32 0	26 6	28 6	23 0

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of April, 1904.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	51 4	51 1	50 2	49 0	53 8*	51 4*
	2nd	49 0	47 2	44 4	44 4	—	46 8*
Cow and Bull ...	1st	—	42 11	42 0	43 2	42 0	38 6
	2nd	—	36 5	37 4	35 0	32 8	32 8
U.S.A. and Canadian :—							
Birkenhead killed	1st	49 0	49 3	46 8	47 10	46 8	43 2
	2nd	45 6	45 3	42 0	44 4	—	33 10
Argentine Frozen Hind Quarters ...	1st	26 10	28 11	30 4	30 4	29 2	29 2
American Chilled Hind Quarters ...	1st	50 2	48 4	47 10	49 0	50 2	50 2
VEAL :—							
British	1st	72 4	69 6	74 8	78 2	74 8	—
	2nd	63 0	53 2	60 8	67 8	65 4	—
MUTTON :—							
Scotch	1st	73 6	—	81 8	80 6	78 2	77 0
	2nd	67 8	—	74 8	72 4	67 8	61 10
English	1st	67 8	65 10	77 0	74 8	—	—
	2nd	59 6	55 6	72 4	65 4	—	—
Argentine Frozen ...	1st	37 4	36 2	35 0	35 0	36 2	36 2
LAMB :—							
British	1st	106 2	98 0	109 8	112 0	112 0	112 0
	2nd	89 10	81 8	102 8	94 6	—	102 8
New Zealand ...	1st	49 0	52 3	49 0	51 4	54 10	56 0
	2nd	46 8	47 2	—	47 10	51 4	51 4
Australian	1st	43 2	43 8	44 4	45 6	45 6	—
	2nd	39 8	39 11	—	43 2	—	—
PORK :—							
British	1st	54 10	56 11	53 8	51 4	51 4	49 0
	2nd	44 4	47 2	46 8	42 0	42 0	39 8

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each of the under-mentioned Weeks in 1904, and in the corresponding Weeks in 1903 and 1902.

Weeks ended (*in* 1904).	Wheat.			Barley.			Oats.		
	1902.	1903.	1904.	1902.	1903.	1904.	1902.	1903	1904.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 2 ...	27 7	25 0	26 3	26 7	23 11	22 1	19 10	16 10	15 5
,, 9 ...	27 8	24 11	26 6	26 7	24 1	22 6	20 0	17 0	15 7
,, 16 ...	27 8	24 11	26 11	26 11	24 1	22 3	20 0	16 10	15 9
,, 23 ...	27 7	25 0	27 3	26 7	24 1	22 4	20 3	16 11	15 11
,, 30 ...	27 4	25 4	26 11	26 7	24 3	22 3	20 2	17 0	15 8
Feb. 6 ...	27 2	25 6	26 9	26 9	23 9	22 4	20 3	16 11	15 11
,, 13 ...	26 11	25 6	26 8	27 5	23 7	22 2	20 3	17 1	15 9
,, 20 ...	27 1	25 4	26 11	26 11	23 4	22 7	20 4	17 1	16 0
,, 27 ...	27 1	25 3	27 10	26 8	23 2	22 4	20 5	17 1	16 3
Mar. 5 ...	27 0	25 3	28 8	26 8	23 1	22 6	20 5	17 1	16 5
,, 12 ...	27 1	25 1	29 1	26 6	22 10	22 5	20 6	17 0	16 8
,, 19 ...	27 1	25 1	28 6	26 4	22 9	22 9	20 6	16 10	16 7
,, 26 ...	27 2	25 2	28 2	27 2	22 4	22 8	20 7	17 0	16 7
Apl. 2 ...	27 3	25 3	27 11	26 5	22 6	22 10	20 6	17 0	16 6
,, 9 ...	27 5	25 4	27 10	26 7	21 10	22 5	21 0	17 2	16 5
,, 16 ...	27 7	25 6	27 9	27 1	21 6	22 6	21 1	17 3	16 4
,, 23 ...	28 9	26 1	27 9	26 5	21 9	22 0	21 6	17 9	16 4
,, 30 ...	29 9	26 10	27 8	27 5	22 1	21 1	21 10	18 0	16 3
May 7 ...	30 9	27 6	27 4	26 10	21 10	20 8	22 6	18 2	16 7
,, 14 ...	31 1	27 9		25 3	22 5		22 5	18 4	
,, 21 ...	31 6	27 10		25 4	23 7		22 6	18 5	
,, 28 ...	31 6	27 8		25 1	23 7		22 10	18 5	
June 4 ...	31 3	27 6		24 3	23 10		22 11	18 4	
,, 11 ...	30 11	27 8		23 8	21 5		22 8	18 7	
,, 18 ...	30 6	27 6		23 5	20 7		23 0	18 3	
,, 25 ...	30 5	27 6		24 3	22 0		22 9	18 6	
July 2 ...	30 8	27 9		25 5	20 7		22 5	18 6	
,, 9 ...	30 10	28 1		24 8	19 11		22 10	18 3	
,, 16 ...	30 11	28 3		23 8	20 5		22 10	18 7	
,, 23 ...	31 5	28 7		25 0	20 10		22 8	18 5	
,, 30 ...	31 8	28 11		25 0	21 0		22 10	18 6	
Aug. 6 ...	31 7	29 3		24 11	20 1		22 11	18 8	
,, 13 ...	31 7	29 11		24 9	21 3		22 2	18 10	
,, 20 ...	31 5	29 9		22 10	20 4		21 11	18 6	
,, 27 ...	31 7	30 0		26 2	22 3		21 0	18 7	
Sept. 3 ...	29 9	30 3		24 6	22 5		19 10	18 5	
,, 10 ...	27 10	28 6		27 5	22 4		19 2	17 0	
,, 17 ...	27 1	27 5		26 4	24 2		18 4	16 4	
,, 24 ...	26 6	27 0		26 4	24 0		18 0	16 2	
Oct. 1 ...	25 10	26 3		25 11	23 9		17 5	15 9	
,, 8 ...	25 5	25 10		26 2	23 8		17 2	15 6	
,, 15 ...	25 1	25 8		26 1	23 9		17 0	15 5	
,, 22 ...	24 11	25 10		26 4	23 7		17 0	15 8	
,, 29 ...	25 0	26 0		26 7	24 2		17 3	15 8	
Nov. 5 ...	25 1	26 4		26 3	24 3		17 2	15 9	
,, 12 ...	25 0	26 6		25 11	24 6		17 3	15 9	
,, 19 ...	24 11	26 9		25 6	24 3		17 2	15 10	
,, 26 ...	25 0	26 6		24 11	23 11		17 0	15 11	
Dec. 3 ...	25 1	26 8		24 4	23 9		17 0	15 9	
,, 10 ...	25 0	26 7		24 3	23 2		16 10	15 9	
,, 17 ...	24 10	26 9		24 2	23 0		16 10	15 7	
,, 24 ...	24 10	26 5		24 1	22 5		16 8	15 6	
,, 31 ...									

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1903.	1904.	1903.	1904.	1903.	1904
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	February ...	38 1	35 10	23 3	22 5	19 3	16 9
	March ...	38 7	37 1	23 8	22 5	19 5	16 10
	April ...	39 11	36 9	23 9	22 2	19 6	16 8
Paris:	February ...	39 7	35 9	23 10	22 2	19 2	17 4
	March ...	39 1	37 4	24 0	21 9	19 1	16 1
	April ...	41 4	37 5	24 2	21 0	18 10	16 5
Belgium:	February ...	27 4	29 7	22 5	21 0	17 9	15 4
	March ...	27 4	30 6	22 5	21 5	17 6	15 5
Berlin:	February ...	34 1	37 0	—	—	20 4	18 3
Breslau:	February ...	31 4	35 4	24 2	22 3	18 0	15 11

AVERAGE PRICES of **British Wheat, Barley** and **Oats** during the Month of April, 1903 and 1904.

—	Wheat.		Barley.		Oats.	
	1903.	1904.	1903.	1904.	1903.	1904.
	s. d.	s. d.	s. d.	s. d	s. d.	s. d.
London	26 1	28 3	23 9	20 3	18 4	16 9
Norwich	25 5	28 10	21 3	22 0	16 10	15 6
Peterborough ...	25 4	26 5	20 0	19 7	16 8	15 1
Lincoln	26 1	26 9	21 6	21 7	16 11	15 11
Doncaster	25 8	26 3	22 4	21 9	16 7	16 3
Salisbury	26 4	28 3	21 3	21 8	17 2	16 9

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of April, 1904.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
British	12 10	11 9	—	—	—	—	—	—
	per cwt.	per cwt.						
Irish	94 8	92 8	—	—	—	—	—	—
Danish ...	99 2	97 0	100 2	96 7	100 2	96 10	100 10	—
French Crocks, etc.... ...	101 0	98 0	—	—	—	—	—	—
Australian ...	89 7	86 5	91 7	89 7	90 2	87 7	91 7	88 0
New Zealand...	90 2	86 7	93 2	91 5	94 0	92 0	93 0	88 0
CHEESE :—								
British Cheddar	72 10	67 7	—	—	74 0	69 7	63 5	58 0
			120 lb.	120 lb.	120 lb.	120 lb.		
,, Cheshire	—	—	64 5	58 0	66 2	61 10	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	49 10	48 10	50 5	45 7	48 11	47 1	51 7	48 10
BACON :—								
Wiltshire ...	77 2	71 7	—	—	—	—	—	—
Irish	61 2	54 5	57 2	55 5	61 7	57 5	52 5	50 6
Canadian ...	47 5	45 7	46 2	43 2	46 5	41 0	42 5	40 10
HAMS :—								
Cumberland ...	96 0	90 0	—	—	—	—	—	—
Irish	90 10	86 0	—	—	—	—	86 0	76 0
American ...	49 10	48 0	53 0	47 0	48 7	44 0	47 11	46 4
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	8 0	7 2	—	—	—	—	—	—
Irish	7 7	6 5	7 0	6 5	6 10	6 2	6 6	6 2
Danish ...	8 0	6 11	7 7	6 3	—	—	7 4	6 5
POTATOES :—	per ton	per ton	per ton	per ton	per ton	per ton	per ton	per ton
Main Crop ...	107 6	97 6	—	—	115 0	105 0	105 0	95 0
Up-to-Date ...	108 9	97 6	124 6	111 0	100 0	90 0	92 6	82 6
HAY :—								
Clover... ...	91 8	84 0	80 7	—	81 3	—	95 10	81 8
Meadow ...	82 9	75 10	66 10	—	57 6	45 0	—	—

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(*From the Returns of the Board of Agriculture and Fisheries.*)

DISEASE.	APRIL.		4 MONTHS ENDED APRIL.	
	1904.	1903.	1904.	1903.
Swine-Fever:—				
Outbreaks	133	111	453	464
Swine Slaughtered as diseased or exposed to infection ...	640	551	2,510	2,185
Anthrax:—				
Outbreaks	90	65	361	269
Animals attacked	118	94	487	417
Glanders (including Farcy):—				
Outbreaks	143	110	511	413
Animals attacked	230	177	949	715
Sheep-Scab:—				
Outbreaks	55	61	886	1,014

IRELAND.

(*From the Returns of the Department of Agriculture and Technical Instruction for Ireland.*)

DISEASE.	APRIL.		4 MONTHS ENDED APRIL.	
	1904.	1903.	1904.	1903.
Swine-Fever:—				
Outbreaks	12	12	41	25
Swine Slaughtered as diseased or exposed to infection ...	370	430	1,041	837
Anthrax:—				
Outbreaks	—	—	2	—
Animals attacked	—	—	2	—
Glanders (including Farcy):—				
Outbreaks	1	—	3	1
Animals attacked	1	—	18	2
Sheep-Scab:—				
Outbreaks	*67	*76	*319	*332

* These figures refer to March, and to the periods ending March, respectively.

LIST OF LEAFLETS ISSUED BY THE BOARD OF AGRICULTURE AND FISHERIES.

(a.) Leaflets dealing with Insects and Fungi injurious to Crops.

No.	Title.	No.	Title.
1	Black Currant Mite.	47	Asparagus Beetle.
2	Vine, Plum, Hop and Raspberry Weevils.	48	Pea and Bean Thrips, or Black Fly.
		49	Fruit Tree Beetle.
3	"Flea" Beetles.	52	Gooseberry Mildew.
4	Winter Moths.	53	Pear Midge.
5	Mangold Fly.	56	Canker Fungus.
10	Wireworms.	60	Goat Moth & Wood Leopard Moth.
11	Daddy Longlegs or Crane Fly.	62	Pear and Cherry Saw Fly.
12	Gooseberry Saw Fly.	64	White Root Rot.
14	Raspberry Moth.	65	Small Ermine Moths.
15	Apple Blossom Weevil.	68	Currant Aphides.
16	Apple Sucker.	69	Tent Caterpillars.
19	Pea and Bean Weevils.	70	Winter Washing of Fruit Trees.
20	The Magpie Moth.	75	Root-knot Disease in Cucumbers and Tomatoes.
22	Diamond-back Moth.		
23	Potato Disease.	76	Cucumber and Melon Leaf Blotch.
24	Ribbon Footed Corn Fly.	77	Finger-and-Toe in Turnips.
25	Chafer-beetles or White-Grubs.	86	Brown Rot of Fruit.
30	Codling Moth.	87	Fungus Disease of Young Fruit Trees.
31	Onion Fly.	88	Hop Aphis.
33	Surface Caterpillars.	90	Pith Moth.
34	Woolly Aphis or Apple Root Louse.	91	Pine Beetle.
35	Celery Fly.	92	Bunt and Smut.
38	Carrot Fly.	94	Millipedes and Centipedes.
41	Red Spiders.	103	Pine Saw Fly.
46	Stem Eelworm.		

(b.) Leaflets dealing with Wild Birds.

40	Kestrel or Wind-hover.	50	Water Wagtails or "Dishwashers."
42	Short-Eared Owl.	51	White or Barn Owl.
43	Titmice.	54	Spotted Flycatcher.
44	Lapwing, Green Plover, or Peewit.	55	Swallow.
45	Starling.	84	House Sparrow.

(c.) Leaflets dealing with Animals, including Poultry.

13	Acorn Poisoning.	82	Preparation of Wool for Market.
21	Warble Flies.	83	Preservation of Eggs.
28	Anthrax.	89	Fluke, or Liver Rot in Sheep.
29	Swine Fever.	95	Ringworm in Calves.
57	External Parasites of Poultry.	96	Parturient Apoplexy.
58	Internal Parasites of Poultry.	100	Pig Breeding and Feeding.
61	Sheep Scab.	101	Prevention of White Scour in Calves.
67	Favus in Poultry.	102	Quarter Ill, Quarter Evil, or Black Leg.
78	Liver Disease of Poultry.		
81	A Substitute for Dishorning.		

(d.) Leaflets relating to Acts of Parliament.

8	Farmers and Assessments to Local Rates.	26	Farmers and the Income Tax.
		27	Remission of Tithe Rentcharge.
18	Fertilisers and Feeding Stuffs Regulations, 1897.	39	Assessment to Land Tax.
		66	Workmen's Compensation Act, 1900.

(e.) Leaflets dealing with Miscellaneous Subjects.

6	Voles and their Enemies.	80	Use of Artificial Manures.
9	Ensilage.	85	Haymaking.
32	Foul Brood or Bee Pest.	93	Farmyard Manure.
36	Cultivation of Osiers.	97	Farmers' Co-operative Societies.
63	Destruction of Charlock.	98	Grading and Packing Fruit and Vegetables.
72	Purchase of Artificial Manures.		
73	Cultivation of Maize for Fodder.	99	Relationship of Woods to Domestic Water Supplies.
74	Purchase of Feeding Stuffs.		
79	Rations for Farm Stock.		

The issue of Leaflets 7, 17, 37, 59 *and* 71 *is suspended.*

Copies of these Leaflets may be obtained free of charge and post free on application to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W. Letters of application so addressed need not be stamped.

POST OFFICE SAVINGS BANKS.

SECURITY.—The Post Office Savings Banks are established by Act of Parliament, and every depositor has the *direct security* of the State for the repayment of his deposits.

DEPOSITS.—Any sum from a shilling upwards, excluding pence, may be deposited at one time, and any number of deposits may be made in the course of a year (ending December 31st) up to a limit of £50. A person may have £200 in all on his deposit account, including interest.

LIFE INSURANCES from £5 to £100 can be granted to persons between fourteen and sixty-five years of age. Children between eight and fourteen years of age can be insured for £5.

OLD AGE PENSIONS.—Provision for old age can be made by buying Savings Bank Deferred Annuities from £1 to £100 to begin at any age selected.

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THE CONSTRUCTION OF PIGSTIES.

The importance of having sound, healthy, and suitable housing for pigs is overlooked, or not understood, by a very large number of pig-owners in Great Britain, many of whom can least afford to waste their money by uneconomical methods. Many members of the working classes, and not a few farmers, by bringing up the animals in cold, damp, and dirty surroundings, are actually throwing away a great part of their labour and trouble, and even running the risk of losing the swine altogether. For it is the foul, badly-built sty, which in bad weather becomes a quagmire, which harbours the germs of disease that too often spreads through the neighbourhood and cannot be got rid of for years. But even where no actual disease appears, all experience shows that swine kept under good conditions thrive better and fatten quicker than those kept in filthy surroundings. The labour and expense of building a good sty, and of keeping it properly, are repaid in a very short time.

Before laying down any rules about how to go to work, the different circumstances under which pigs are kept must be considered. Some pig-owners live in urban centres where ground is valuable and in demand, not only for gardens and allotments, but also for building houses. It is obviously of no use to build an expensive sty if the land is likely to be used for other purposes in a short time. Other owners live in country places where land is plentiful, but building material scarce and troublesome to get. In such cases the owner must use

what he can find. Sometimes stone is easily procured, sometimes bricks, and sometimes neither. The size and kind of pig-house must depend on the class of pig rearing that is practised in the district, and the plans must be adapted to meet the different requirements of breeding or fattening. If the pig-owner lives in a dairying county, a wheat-growing district, or a potato-growing centre, he must modify his plans to suit the wants and customs of his neighbourhood; and must not think, for example, of putting a Large White Yorkshire sow into a sty which would be just suitable for one of the small breeds.

In every case, however, the man who sets about building a sty must aim at getting as much sunlight, fresh air, and dry footing as he can, and, if circumstances make it impossible for him to get all these three requirements, he had better not build the sty at all.

The simplest way of dealing with the question of how to build useful, sound, and cheap housing for pigs is to begin with the case of the workman or labourer who, for one reason or another, has only need for one sty, and to lead up from this to a description of a more elaborate piggery where many swine—and those of all ages and sizes—are kept, and where the expenditure of money is a less serious consideration, though the requirements which are necessary where one pig is kept are equally necessary where twenty or fifty are kept.

The first and most important part of every sty is the floor, and every effort should be made to see that this is in all respects satisfactory, even if the rest of the building has to suffer a little. Swine can keep healthy and grow fat in a poor house if the floor is well made, but there is great danger of their pining and falling sick on a cold, damp floor even if they have a magnificent roof over their heads. A broken floor in which puddles of rain water or urine can lie is a breeding place for sickness and parasites of all sorts; moreover, it gives the pig a chance of rooting, which he will generally be prompt to use, often not stopping till nearly the whole of the floor is upturned. The floor, therefore, must be made of some hard substance, which is not brittle, and does not too readily break up. The best material for this purpose is concrete or Portland cement,

though a useful flooring can also be made with a mixture of tar and gravel, stamped and rammed into a solid block. Care must, however, be taken in this case not to let it be exposed too long to the sun's rays lest the tar melt and make the whole surface soft. Bricks cannot be recommended unless they are new and unbroken and are laid in cement at least six inches deep, and even then they are liable to chip and crack, which is a great disadvantage, as puddles are sure to come. Stone flags are bad, as the manure sinks in between the joints and makes the soil underneath impure and stinking, while wooden floors, unless movable, are wholly to be condemned as dangerous and mischievous in the last degree. Concrete, therefore, should be used whenever possible.

The preparation of such a floor is well within the means of every workman who earns enough to afford to buy a pig, and it is not difficult to make. It should be laid with a gentle slope towards the front of the sty, and it is advisable to make the top of the outer court lower than the bottom of the slope of the inner court by about two inches. There will thus be a small step between the two courts, which will enable drainage water to fall with a rush and run away more rapidly. The object of this is to secure dryness under foot, for, as has been already said, that is not only more healthy for the pig, but it helps to keep the floor from splitting or breaking away. Small channels should also be made in the cement before it has hardened, and these should run diagonally, in parallel lines, and not cutting across each other in the way that is termed cross-hatching. These diagonals or sloping lines should run from right to left on the inner court, and from left to right in the outer court. The reason for this will be given later on. Before leaving this subject it is as well to emphasise this point :—The slope of the floor should not be so great as to make it slippery, lest the pigs on running out to their food should hurt themselves, and for the same reason the surface of the cement between the channels should be left slightly rough.

The next point to be considered is the walls. These are too often made of wood, which is generally an unsuitable material, and should only be used when nothing better is to be had. Old planks and parts of packing cases or boxes are to be con-

demned, though railway sleepers (if in good condition and well bedded) are very serviceable, especially if an additional coating of tar is given to preserve them. Bricks, however, make the best kind of wall, and should be employed where possible if only for the lower part of the building. A wooden fence may be well built on the top of two or three suitably laid rows of bricks. The jointure of the wall and the floor should be carefully attended to, as, if moisture gets in, the cement floor may be broken and the whole work wasted. It is very advisable, therefore, to add a little cement sill at the bottom of the wall to fill up the angle, and make the water run away into the channels. If bricks cannot be got—and there are many places where bricks are scarce—stone flags may be set upright, and made into a sort of paling. This is done in many parts of Lancashire. But if it is found that neither bricks nor stone can be got, and it is considered too expensive to build a concrete wall, wood must be used. In that case a sheet of zinc or iron should be screwed on the wooden walls in the inside of the pigsty to preserve them from damp. Walls should, of course, be built firmly, but care should be taken not to build them so high as to shut out the light and air from the swine, and a few gaps may be left outside provided that they are not big enough to allow any other animal such as a rat to get in. These gaps should not be so many as to prevent the walls being a protection against the wind and the cold.

The walls being built it only remains to add the roof. It should be raised well above the floor of the inner court, leaving room for plenty of fresh air, without which the pigsty becomes very foul and liable to spread disease. The roof should, in fact, be high enough in at least one place to enable a man to stand up when he is cleaning the floor. This can be easily done in the kind of shed known as the "lean-to," which is the most popular form. The material out of which the roof is made is of no great importance provided that it keeps out the wet and the cold. Tiles, slates, thatch may be used, and in many parts of Yorkshire tarred brattice cloth is commonly employed. Iron, however, should not be used, at any rate alone, as it lets in the heat in summer and the cold in winter. A window is strongly recommended for the purpose of letting in light, and for this

purpose there should certainly be a pane of glass let into the wall or the roof if a proper window cannot be built. It cannot be too often repeated that light, warmth, dryness and cleanliness are necessary for the profitable keeping of pigs.

In all the description that has been given it has been assumed that the inner court stands four square behind the outer court from the point of view of a person looking over the wall at the bottom of the sty. The entrance from the outer to the inner court should be on the left-hand side from the same standpoint, and the pig's bed, therefore, will be on the right-hand side, or the innermost part of the whole sty. Now a healthy pig seldom leaves any droppings or water in its bed, but in case any liquid should get there it is as well to make a small drain running straight from the place where the bed is put to the outer court, and so on to the bottom of the sty. The bed should be a very low platform of wood, just raised high enough to allow free ventilation, and should be covered with plenty of straw, bracken or litter, which should be kept fresh and never allowed to get foul. If the sow is littering a piece of piping should be fixed against the wall, a few inches away, to prevent her overlaying her young ones. With all this the inner court may be considered complete.

In the outer court the drainages should run down to the right-hand side, as already said, and that for two reasons. In the first place the pig's trough should be at the bottom of the sty, on the left-hand, in order that the pig may come straight out of the inner court to the food. This trough should be made of earthenware or iron and should be fastened firmly to the ground. Just over this trough there should be a hole in the wall, with a falling door made of iron, so fitted that the pig's food can be poured straight into the trough without going inside the sty. If this is thought too expensive, an earthenware pipe might be fixed in the wall, slanting at such an angle that all food poured in at one end must run into the trough. Care should be taken to keep the trough and the pipe clean and free from all stale food or pig's droppings. On the right-hand side, at the bottom, should be the gate leading into the outer court, and the drain should run straight down from the pig's bed to this gate, and that is the second reason why the

drainage should run to the right. But when collected there it should not be allowed to lie but should be led away by an open drain to a sump at some distance, far enough off at any rate to keep the sty from stinking of it.

The outer door must, of course, be strong; it would be a foolish waste to build good walls and leave a rickety gate. It is only necessary to say that if it is of wood it should have a plate of iron or zinc screwed on to the inside to prevent its destruction by the pig. Some people advise a door between the inner and the outer court. It is advantageous but not necessary. If it is added it should be made in two parts, an upper which can be bolted at pleasure, and a lower part which swings freely without quite touching the ground.

All the description that has been given so far applies to the building of a single sty, but should the owner wish to keep more pigs, he can put up more sties on the same model, side by side to each other, without any alteration. It should, however, be remembered that each sty must have a separate drain, as described above, and it will not do to make one drain go through all the sties, as is done sometimes from a mistaken notion that it is cheaper. It is really dearer, for the sty through which the drain passes last is always wet and unhealthy, and if disease breaks out in the top sty, all the swine are likely to catch it. An excellent way is to put the sties back to back, with a small gangway between, down which a man can walk, and from which he can see if the swine are faring well, or climb over the wall to clean out their beds. This plan has also the advantage that it gives more air to the inner courts of the sties. It is perhaps as well to add that if a number of pigs are kept in one sty the trough should be so arranged as to prevent the animals crowding one another.

If a really large number of swine are kept, it is very advisable that the piggeries should not be all together. Let there be several sties in different parts of the farm, with some sheds for the boars, some for the in-pig or farrowing sows, some for the stores, and some for the fat pigs. Let there also be an isolation shed into which a pig can be put should he be noticed to be amiss or off his feed for more than a single meal. It is a serious matter to get disease into a valuable herd, and precau-

tions should be taken at once to isolate the infected animal as well as to notify the fact in the way provided by the law.

THE ARTIFICIAL HATCHING OF CHICKENS.

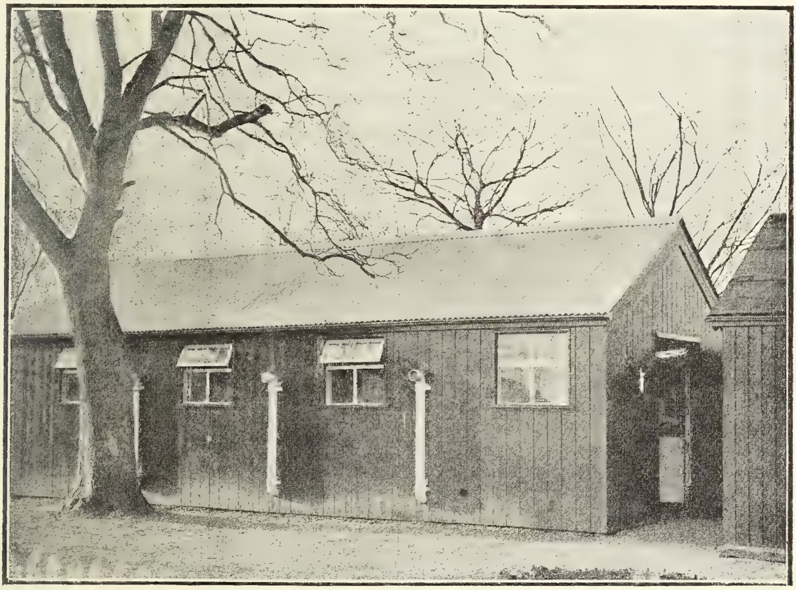
With the greatly increased attention given to the rearing of poultry which has marked the last decade, a modification of methods previously adopted has been strongly in evidence. Consumption of eggs and chickens and ducklings has grown enormously, both as to the numbers required to meet market demands and the periods of the year when produced. In no direction is this modification to be noted more than in the employment of artificial hatching and rearing, for it is not too much to say that the increase of supplies would have been practically impossible to the extent now seen had the natural system been entirely depended upon. Hence incubators and brooders are largely employed. The natural functions of our hens are supplemented by machines, which have been brought to a high state of perfection, although they may not have reached the final stage of their evolution.

The question is frequently asked whether artificial hatching is satisfactory. In the minds of practical poultry-keepers there is no doubt whatever. They recognise that it would be difficult to carry out their operations were hens only to be entirely depended upon for the work of hatching and rearing. Early chickens and ducklings, either for killing or as laying stock, would be fewer than is the case at present, even though the supply is still very deficient. But of actual data showing the results from incubators we have not much that enables farmers and others to realise the benefits of the system. During the twelve months ending March 31st, 1904, a careful series of observations have been made at the College Poultry Farm, Theale, where the practical instruction in poultry-keeping is given to students attending courses at the University College, Reading. The following notes embody these observations.

Where operations are upon a small scale, the recommendation has generally been made that an incubator should be placed where variations of atmospheric temperature will be minimised as far as possible, and sweet, well-ventilated cellars are frequently used as hatching chambers. No place could be more suitable where only one or two machines are worked. These machines may be depended upon to maintain a fairly even temperature in the egg chamber, provided that the range of variation to which they are subjected is neither wide or abrupt. But they have their limitations, and are unable automatically to provide for sudden rise or fall in atmosphere. For that reason a slightly built structure, exposed to cold or heat, involves greater attention in working incubators placed in them on the part of the operator. With the increased use of incubators, and the need for a much larger egg capacity at one time, special buildings are required, and these are now to be met with to an extent not anticipated a few years ago. In America huge plants are to be found, where 30,000 to 40,000 birds are hatched annually, and there are in this country establishments which are not far behind. Across the Atlantic, however, the climatic influences are very different from those met with in the United Kingdom. To meet the extreme cold of winter and the great heat of summer in America it has been found desirable to place incubator houses partly underground, for the reason already given. But with the more equable climate of the British Islands, above ground erections, provided they are well built, yield satisfactory results, and the expense of excavation is thus avoided. A reference to Table I. will show that the variations are by no means so great as might have been anticipated in what may reasonably be termed the hatching months of the year, although it must be remembered that the summer of 1903 was marked by the absence of high temperatures.

To meet the demand for increased accommodation and the requirements of students, the University College, Reading, erected upon the College Poultry Farm, in the early part of 1903, an incubator house designed by Mr. Edward Brown, F.L.S., the Lecturer in Aviculture. This house is 32 ft. long by 16 ft. wide. It has double walls of inch deals, between which felting is placed. The roof is of inch deals, covered with felting first, and finally

with corrugated iron. It is lighted by four windows facing the east, so as to avoid the sun's rays passing into the room. The walls stand upon a double row of bricks, and the floor is laid with Staffordshire tiles. Inside, the building is divided into two compartments; first, the outer porch, 5 ft. by 16 ft., where stores are kept and lamps cleaned; and, second, the incubator room, 27 ft. by 16 ft., connected by double folding doors. As a dozen machines have to be accommodated in this room, the consump-



INCUBATOR HOUSE, SHOWING SYSTEM OF VENTILATION.

tion of oxygen—both by the oil lamps heating the machines and the requirements of 1,200 eggs—must necessarily be considerable. Hence great attention was given to ventilation. Fresh air is drawn into the incubator room by eight four-inch pipes, shown in the drawing, the cowls of which are 6 ft. above the ground outside, and the air enters the room below the level of the machines, so that as it ascends both lamps and eggs in the incubators receive a plentiful supply of absolutely fresh air. Were the circulation downwards upon the machines, the air before reaching the eggs would necessarily be

affected by the lamps. To this system of ventilation may be attributed much of the success recorded below. The house is placed in a sheltered position, under the shade of a large walnut tree, with a view to modification of summer heat.

TABLE I.—*Comparative Temperatures in the Open Air and in the Incubator Room.*

Date.	Outside.		Incubator Room.		
	Maximum Temp.	Minimum Temp.	Temp.	Morning humidity of Atmosphere (*).	Afternoon Temp.
1903.	° F.	° F.	° F.		° F.
March 12	51	27	58	66	59
,, 20	56	41	61	74	64
,, 28	60	39½	62	64	62
April 3	50	29	62	62	68
,, 4	55	47	62	73	67
,, 16	47	25½	59	56	61
,, 23	43	28	59	60	58
,, 30	60	46	63	66	68
May 8	62	35	64	62	64
,, 15	62	45	66	59	68
,, 19	63	32	66	64	69
,, 28	70	54	68	74	71
June 3	82	40	58	57	62
,, 13	57	39	69	68	61
,, 24	72	53	70	56	74
July 2	89	46	66	68	78
,, 14	65	42	66	64	69½
,, 25	77	43	66	72	69
Aug. 10	70	54	67	68	69
,, 25	56	52	62	72	66
1904.					
Jan. 13	51	44	50	94	40
,, 17	42	27	42	93	49
,, 23	42	23	42	89	49
,, 30	46	40	51	94	52
Feb. 6	48	35	55	80	54
,, 12	42	29	52	81	52
,, 13	49	39	54	70	56
,, 22	53	47	55	70	59
March 4	40	26	51	74	48
,, 10	57	38	49	69	52
,, 17	49	26	55	93	59
,, 24	48	36	50	94	54
,, 30	53	30	52	82	56

* In the room a wet and dry bulb thermometer is used, by which the temperature of the room is recorded, together with the saturation point; and the humidity is calculated by a Negretti and Zambra moisture meter.

It is interesting to note how far the extremes of outside temperature affect the atmosphere within the incubator

room. The maximum and minimum outside temperature, the morning temperature and humidity of the atmosphere, and the afternoon temperature in the incubator room on a number of selected days from March 12th, 1903, to March 30th, 1904, are shown in Table I. On April 16th, 1903, when 6½ degrees of frost were registered, the inside air did not fall below 59 Fahrenheit, and on January 23rd, 1904, when 9 degrees of frost were registered, the inside temperature was 45 Fahrenheit. On the other hand, on the hottest day recorded, July 2nd, 1903, when a maximum temperature of 89 degrees is given, the inside temperature was not above 78 Fahrenheit. The variations of temperature in the room were as follows :—

Month.	Highest Temperatures.	Lowest Temperatures.
1903.	° F.	° F.
April	69	57
May	76	62
June	82	57
July	82	60
August	73	60
1904.		
January	54	41½
February	59	47
March	65	46

For these observations four classes of machine were used, namely, A, Hearson's Champion ; B, Tamlin's Nonpareil ; C, the Cypher's; and D, the Clive. A, B, and C are well known representing two types. A and B are provided with tanks, and have bottom ventilation ; C is a hot-air, non-moisture machine, in which the circulation is downwards. The Clive (D) is a new form of incubator sent for trial. At the College Poultry Farm the machines are worked by students, under supervision of the practical instructors, Messrs. T. & W. Brown, but in the case of the Clive it was operated entirely by the instructors, and some at least of its success may be attributed to expert control, as its regulation was not nearly so steady as in the others. From May 23rd to June 11th, 1903, the variations recorded in the last-named machine were from 94 degrees to 101½ ; and from June 18th to July 8th, 1903, from 94 degrees to 102½. Table II., on page 141, gives the record of each machine

during the twelve months, showing (1) number of eggs placed in machine; (2) number of fertile eggs as revealed by testing on the seventh day; (3) number of chickens hatched; and (4) percentage of fertile eggs hatched. The true test of any incubator is its results in regard to fertile eggs, as the non-fertiles should not be included in calculation of percentages.

It is interesting to note the records of various machines, though special circumstances may explain why results are sometimes less satisfactory at one time than at another.

Month.	Class of Machine.	Highest Hatching Percentages.	Class of Machine.	Lowest Hatching Percentages.
1903.				
April	B.	92·10	A.	51·02
May	B.	91·3	B.	63·29
June	C.	88·68	C.	67·5
July	B.	92·3	A.	62·22
August ...	C.	84·72	C.	64·22
September ...	A.	84·21	A.	75·51
1904.				
February ...	B.	88·88	C.	55·68
March... ...	A.	82·89	C.	50·0

It is suggestive that in this connection all the highest percentages were obtained by machines in which after testing, the removal of the non-fertile eggs reduced the number remaining much below the capacity of the egg chamber, indicating that overcrowding is undesirable in the embryonical stage of a chicken's development.

During the year under review testing of the thirteen incubators worked revealed 3,674 of fertile eggs, and from these 2,572 chickens and ducklings were hatched, giving the percentage of a fraction over 70, which cannot but be regarded as satisfactory. The monthly averages are shown below.

Month.	No. of Hatches.	Fertile Eggs Hatched.
1903.		
April	12 ...	71·48 per cent.
May	10 ...	76·38 " "
June	12 ...	78·03 " "
July	5 ...	81·12 " "
August	2 ...	72·38 " "
September	2 ...	79·31 " "
1904.		
February...	8 ...	67·94 " "
March	11 ...	75·4 " "

TABLE II.—*Hatching Records.*

Date of Hatching.	Class of Machine.	No. of Eggs.	No. of Fertile Eggs 7th day.	No. of Chickens Hatched.	Fertile Eggs Hatched.
1903.					Per cent.
April 1	B.	61	38	35	92·10
,, 4	B.	108	88	61	69·31
,, 6	C.	48	34	29	85·29
,, 6	A.	55	46	32	69·56
,, 14	C.	118	103	77	74·75
,, 15	B.	96	74	47	63·51
,, 17	A.	57	49	25	51·02
,, 18	A.	110	87	58	66·66
,, 19	C.	123	108	67	62·03
,, 24	C.	51	46	31	67·39
,, 28	A.	56	47	42	89·36
,, 29	C.	74	69	60	86·95
May 2	B.	48	23	21	91·3
,, 7	B.	95	80	62	77·5
,, 7	C.	67	63	49	77·77
,, 8	C.	43	31	25	80·64
,, 10	A.	56	50	36	72·00
,, 18	A.	60	48	43	89·58
,, 20	C.	36	28	25	89·28
,, 25	B.	94	79	50	63·29
,, 25	B.	61	48	32	66·66
,, 29	A.	92	75	58	77·33
June 1	A.	33	24	21	87·5
,, 2	C.	51	40	27	67·5
,, 2	B.	68	62	46	74·19
,, 7	C.	38	32	26	81·25
,, 8	C.	53	42	35	83·33
,, 12	D.	48	37	26	70·27
,, 15	A.	32	26	22	84·61
,, 26	B.	66	52	41	78·84
,, 26	C.	62	55	43	78·18
,, 26	C.	60	53	47	88·68
,, 26	A.	120	98	72	73·46
,, 29	B.	49	39	31	79·48
July 2	C.	50	39	32	82·05
,, 3	B.	32	26	24	92·3
,, 5	A.	54	43	38	88·37
,, 9	D.	49	48	41	85·41
,, 13	A.	56	45	28	62·22
August 4	C.	120	109	70	64·22
,, 31	C.	100	72	61	84·72
Sept. 2	A.	60	49	37	75·51
,, 2	A.	50	38	32	84·21
1904.					
Feb. 6	A.	40	27	23	85·18
,, 9	B.	39	18	16	88·88
,, 11	C.	57	44	25	56·81
,, 15	C.	110	88	49	55·68
,, 18	B.	85	61	42	68·85
,, 25	C.	105	78	62	79·48
,, 25	B.	40	30	18	60·0
,, 29	B.	100	72	49	68·05
March 6	C.	220	169	105	62·13
,, 7	A.	24	21	16	76·19
,, 10	C.	187	137	88	64·23
,, 14	C.	120	102	51	50·0
,, 19	A.	100	76	63	82·89
,, 19	C.	120	96	55	57·29
,, 24	B.	61	55	27	49·09
,, 25	B.	47	31	16	51·61
,, 25	A.	97	74	54	72·97
,, 25	B.	98	90	68	75·55
,, 30	C.	180	149	111	74·49

It is evident that we cannot expect the same average results out of what may be termed the natural period of hatching. viz., March to July, probably owing to the fact that the germs within the eggs are more vigorous at that season.

Much controversy has arisen as to the relative merits of tank and hot-air machines, and it is interesting to study the comparative results in hatching, though probably the advocates of each system may be surprised that these vary so little.

TABLE III.—*Hatching Results in Tank and Hot-Air Incubators.*

Month.	Tank Incubators.		Hot-Air Incubators.	
	No. of Hatches.	Percentage of Fertile Eggs Hatched.	No. of Hatches.	Percentage of Fertile Eggs Hatched.
1903.				
April	7	69·92	5	73·33
May	7	69·74	3	81·14
June	2	76·62	2	80·18
July	2	80·86	1	82·05
August ...	—	——	2	72·38
September ...	2	79·31	—	——
1904.				
February ...	5	71·1	3	64·76
March... ...	6	70·31	5	66·15
Year's Average	31	70·89	21	68·95

It is desirable to mention that in an incubator house such as that in which these observations were made, the steadying advantages of tanks in meeting great variations of temperature are not so much in evidence as would be the case under less favourable conditions, whilst, on the other hand, in the hot-air machines there would be a lessened stress on the regulating apparatus, due to the avoidance of extremes. It is important, therefore, to keep that fact in mind, for the results might be entirely different where the atmospheric influences were nearer to the ordinary temperatures of both day and night. The night-time is most dangerous in winter, and the daytime in summer.

Taking the entire year, the tank machines have given the higher averages, but on reference to Table III. it will be seen that in four months the hot-air incubators were in advance of

the tank incubators. The records of the various types of machines employed, taking the entire period of twelve months, were as follows :—

Class of Machine.	No. of Hatchings.	Hatching Percentages of Fertile Eggs.
A.	18	75·83
B.	18	71·01
C.	24	69·94
D.	2	78·82

The great majority of the eggs hatched were from hens, as natural methods are chiefly employed for duck eggs on the College Poultry Farm, Theale, but six hatches of the latter were made by artificial methods, the results of which were as follows :—

Date Hatched.	Class of Machine.	Fertile Ducks' Eggs Hatched
1903.		
May 2	A. ...	91·3
,, 8	C. ...	80·64
July 3	B. ...	92·3
,, 5	A. ...	88·37
1904.		
March 7	A. ...	76·19
,, 25	B. ...	51·61

Two of the highest records, above 90 per cent., were made with duck eggs, but, confirmatory of what has already been stated, in each of these cases the machine employed was not worked at its full capacity.

The result of these observations prove that hatching houses can be successfully employed on a larger scale than has hitherto been thought desirable, and that a percentage of hatching may be obtained of more than 70, even where the operators have not had much experience. But to secure this result the conditions must be favourable, more especially in respect to ventilation.

FARMS IN DENMARK.

Before 1792 the land in Denmark was principally held by a few large proprietors, and since that time it has been gradually passing into the hands of the tenants, and is now held chiefly by peasants themselves as proprietors. The distribution of the land at present, according to the latest returns available, is as follows:—Estates from $\frac{1}{4}$ to 6 acres, 92,656, having a total acreage of 155,766, or an average per farm of 1·6 statute acres each; from 6 acres to $24\frac{1}{2}$ acres, 66,491 estates of 836,658 acres, or an average of 12·6 statute acres each; over $24\frac{1}{2}$ acres, 73,889 estates of 5,514,978 acres, or an average of 74·7 statute acres each. The average size of the holdings in Denmark is $23\frac{1}{2}$ statute acres each, and 90 per cent. of the occupiers are proprietors.

The Report of the deputation which visited Denmark in 1903 on behalf of the Irish Department of Agriculture, states that the system of transfer from the large land owners to the peasants was gradual up to about the year 1851, when a great stimulus was given to the desire for ownership by the establishment of companies in Denmark, who provided capital to the would-be proprietors on mortgages of the acquired holdings. These mortgages, which amounted in most cases to about one-half of the value, were repayable with interest by annual instalments for fifty years as a minimum, so that at the present time those who availed themselves of these financial societies, on their minimum number of years' purchase, are now absolute holders. Most of the purchasing occupiers, however, took longer periods, some even up to one hundred years, for repayment of the capital.

The interest and repayment of these loans are still a very heavy drag upon the farmers; but at the same time they are cheerfully borne. The farmer feels, if he is a young man, that he will one day benefit by having no further instalments or interest to pay, and practically the whole of the profit from his farming will be for his own use; while the load is carried lightly, seeing that he takes a more intelligent interest in his

farm, and works the land and attends to his stock, so that they produce more profit, thus giving him about the same amount more in profit for his own use, as he would have to pay in repayment of loan, interest and taxes. Again, if he has a son, he feels that he has paid off so many instalments that when his son succeeds he will in all probability come into the full enjoyment of absolute ownership. In the case of one small farm, which was visited by the deputation, the proprietor had seven years' more instalments to pay, and in his case he had six acres, for which, in interest and repayment, he had to pay 200 kroner, or £11 3s. annually, of which 60 kroner, or £3 7s. 6d., were rates and taxes, local and State, the remainder being instalments and interest on the original mortgage. This man kept three cows, bringing him in gross £13 10s. each, or about £40 10s. per annum from milk alone. He sold the calves at good prices, as a rule, to the local co-operative store for butchering. He also kept some pigs, sending in about ten yearly to the bacon factory, obtaining for each about £3 5s., or about £32 per annum for all. His manure cost him nothing, as he saved his farmyard manure. Seeds, which he bought from the Co-operative Society, his own food and that for his horse were his only expenses.

The type of farm which prevails throughout the country is described as follows. In shape the buildings are in a square for a farm of about 24 acres and upwards; but in smaller farms the buildings are formed in an " L " shape. In the square farmsteads one side is given up to the dwelling-house, and though this generally faces the approach road, the door is at the back —inside the square. The farm is entered by an archway, generally on one side of the square; opposite the house is the hay and straw barn; on one side are the stables for the horses and the thrashing-floor; opposite these, again, is the byre and pigsty. Outside of the square, and behind the byre and pigsty, are generally placed the manure pits, one being for the dry manure, and the other for the liquid.

The whole object of farming in Denmark is milk production. The milch cows are almost entirely fed in the house, except for about 14 weeks in the summer, when they are let out for about six hours in the day.

The dimensions of the cattle byre are as follows:—The whole width of the building is about 33 ft., which is allotted as follows:—In the centre is a passage about 4 ft. wide, and about 18 in. above the floor level. This passage is utilised by the attendant for the purpose of feeding into the bins on either side. These bins are each about 2 ft. wide, and are partitioned, allowing one for each beast. There are stanchions between each stall, and the standing space for the cow itself is 6 ft. deep, and is on a slope, so that all liquids, &c., quickly drain off into the drain passage at the back of the stalls. This drain passage is about $1\frac{1}{2}$ ft. wide, having a drop from the floor of the stall of about 9 in. Then, again, beyond this drain, up to the wall of the byre, is a passage for the attendant to remove the dung, and to pass behind the cow. This passage would be about 5 ft. wide as a rule, and also slopes downwards towards the drain. The liquid manure collected in these drains is taken away by pipes to the liquid manure pit.

In all farms where over 30 milch cows are kept, the above is the principle adopted by most farmers. Where the farms are smaller the relative half of the above dimensions would be the plan adopted.

The manure is considered by farmers in Denmark one of their largest assets, and such importance is attached to farmyard manure that a lot of capital is often expended in order to save and keep it on the most up-to-date principles. First, as regards the liquid manure, as explained above, a channel runs at the back of the cow stalls, and in this all manure collects. The liquid manure, however, runs off to traps in the channels and falls into a pipe leading to the liquid manure tank. The following gives a general description of the liquid manure pits:—They are built of brick and cement or concrete, and are circular in shape, about 24 ft. in diameter, and about 20 ft. deep. The bottom of the tank, however, slopes to a point which forms a sump hole. If the farm is placed on a knoll, with a good slope, the pit is placed at the highest possible point which will admit of a good flow from the drains at the back of the cow-stalls into the pit. A pipe is then run underground from the bottom of the tank until it comes out on the surface of the lower ground, and the earth is so cut away at that point as to admit of

a cart being placed underneath a tap. Where, however, no fall in the ground assists the farmer, a pump has to be erected over the tank and the manure pumped out into the cart. The tank is roofed to prevent rain from falling in and thereby diluting the fluid. The cart body, with a large barrel (about 3 ft. in diameter and about 10 ft. long) placed upon it, is drawn up under the pump or tap, as the case may be, and the barrel filled. The fluid collected in the farm tank is sufficient to manure the grass and root crops of the farm. This tank of liquid manure does not appear to constitute any nuisance or danger to health.

The dung and litter is collected carefully in another pit, which has sloping sides and bottom, and any fluid is collected in a sump hole and pumped out and used as required. These manure pits are often covered with a roof to prevent wet getting at it and thus taking away a great deal of the manure value by dilution. This manure is all carefully preserved, and in the early months of the year spread over the land and carefully ploughed in. By attention to such details the Danish farmer does not require to buy artificial manure to any large extent.

Freight Rates on Grain.*

According to an extract from the Chicago *Inter Ocean* of April 15th, received by the Board of Trade from the British Commercial Agent at Chicago, the traffic officials of the railways in the Central Freight Association met at Chicago and agreed to maintain "indefinitely" the rates which have been in effect during the winter on grain and grain products from that port to the Atlantic ports.

These rates are :—To New York, on grain and grain products for domestic use, 20 cents per 100 lb. ; on grain for export, 15 cents per 100 lb. ; on grain products for export, $16\frac{1}{2}$ cents per 100 lb. The rates to Philadelphia are 2 cents less on grain products and 1 cent less on grain, and the rates to Baltimore are

* *Journal*, Vol. X., No. 1, June, 1903, p. 89.

3 cents less on grain products and $1\frac{1}{2}$ cents less on grain than the rates from Chicago to New York.

The Western lines have agreed to restore grain rates to the basis of 14 cents per 100 lb. between Missouri River points and Chicago. The rates from Missouri River to the gulf ports will also be restored to the normal basis of 18 cents.

The reason why grain from Nebraska, Kansas, and other trans-Missouri territory is sent to the gulf ports for export instead of *viâ* Chicago to the Atlantic ports, is because the rate from Kansas City to New York is 29 cents per 100 lb., and from Kansas City to New Orleans 18 cents, or 11 cents per 100 lb. less than the rate to New York.

During the season of lake navigation practically no grain for export goes entirely by rail from Chicago to the Atlantic ports. Every summer less grain is shipped by lake from Chicago for export, the low rates by the gulf ports during winter having been utilised by shippers, who in former years had to store their grain or pay the high rates demanded by the Eastern lines.

Admission of Tunisian Wheat into France.

It has been the practice of the French Government to vote a certain sum annually for the purpose of allowing a specified quantity of Tunisian grain to enter France free of duty. The amount allowed for 1904 was fixed at 800,000 quintals (1,574,000 cwt.), but, owing to the plentiful harvest of last year, this limit was exceeded early in March, when the exportation was still proceeding briskly. The free export was for a time suspended, and payment of the duty was demanded on grain which had arrived at Marseilles in excess of the quantity allowed. As the result of the negotiations which ensued a supplementary "credit" has been granted for the introduction into France, free of duty, before 30th of June, 1904, of a further 350,000 quintals of wheat and 200,000 quintals of barley from Tunis.

Wheat and Linseed Crops in Argentina.

The area sown with wheat and linseed, and the quantity harvested in the four principal agricultural provinces of Argentina in 1902–3 and 1903–4, is given in a report of H.M. Consul at Rosario as follows:—

Province.	Wheat.		Linseed.	
	Area.	Quantity Harvested.	Area.	Quantity Harvested.
	Acres.	Tons.	Acres.	Tons.
Buenos Ayres	3,287,214	1,259,112	863,899	307,431
Santa Fé	3,164,689	793,230	1,621,224	282,086
Cordoba	1,743,244	581,781	383,687	66,482
Entre Rios	506,231	104,730	237,139	54,153
Total, 1902–3 ...	8,701,378	2,738,853	3,105,949	710,152
,, 1903–4 ...	10,485,325	3,700,000	3,672,591	883,000

The figures relating to the produce in 1903–4 are preliminary estimates.

[*Foreign Office Reports, Annual Series, No.* 3,157.]

Wheat Harvest of Australasia.

The estimates of the acreage and yield of land under wheat in the various Colonies of Australasia in 1902–3 are shown in the following table, together with similar details for the previous seasons.:—

Colony.	Area. (In thousands.)			Produce. (In thousands.)		
	1902-3.	1901-2.	1900-1.	1902-3.	1901-2.	1900-1.
	Acres.	Acres.	Acres.	Bushels.	Bushels.	Bushels.
Victoria	1,994	1,754	2,017	2,569	12,127	17,847
New South Wales ...	1,280	1,392	1,531	1,585	14,809	16,174
Queensland	2	87	79	6	1,692	1,194
South Australia ...	1,747	1,743	1,913	6,355	8,013	11,253
Western Australia ...	92	95	74	986	957	775
Tasmania	41	44	52	877	964	1,110
New Zealand	195	167	206	7,458	4,047	6,527
Total ...	5,351	5,282	5,872	19,836	42,609	54,880

Owing to the drought, the wheat crop of Victoria, Queensland,

and New South Wales in 1902–3 was a complete failure, and, relatively to the acreage, the yield of the seven Colonies was much below that of any previous year. In 1903–4, on the other hand, it is evident from the official figures which are already available, that the yield will prove to be the largest ever known. The production in Victoria is returned at 28,356,000 bushels; in New South Wales at 27,334,000 bushels; and in Western Australia at 1,900,000 bushels; while, according to figures given in the *Queensland Agricultural Journal*, the yield of South Australia is estimated at 14,000,000, and of Queensland at 2,500,000 bushels.

Effect of Thin Seeding on Malting Barley.

The injurious effect of thin seeding on the quality of malting barley was the subject of some experiments carried out by Mr. E. S. Beaven at Warminster, and reported in the *Journal of the Federated Institutes of Brewing* (Vol. VIII., No. 5).* Seven varieties of barley were selected, viz., Invincible, Standwell, Hanna, and Goldthorpe, two well-known sorts of true Chevalier, and Archer's stiff straw. These seven sorts were grown in 1900 under three conditions as to quantity of seed, viz., 3 bushels per acre in drills 7 in. apart, 1½ bushels in drills 14 in. apart, and 1 bushel in drills 21 in. apart. The weight of seed in each drill was therefore the same in all cases. The excessive widths between drills (14 in. and 21 in.) and the small weight of seed on unit area were adopted, with the special object of exaggerating the effects due to thin seeding. In the subsequent year the seeding was 4, 2, and 1⅓ bushels per acre, in drills respectively 4, 8, and 12 in. apart. The result showed that the effect of giving the individual seed at and after planting time over-abundant soil space and plant food was to produce a coarse plant, which would only mature large, steely, unworkable grain—a grain which the brewer does not want, and which cannot compete with foreign six-rowed sorts. The less competition and the less restriction

* See *Journal*, Vol. XI., April, 1904, p. 39.

there is in root development in the early stages, the more gross will be the vegetation and the greater the risk of coarse grain. The very wide planted barleys in this experiment were coarse and nitrogenous compared with those planted closely. Close planting can easily be carried too far, and no doubt long experience has taught growers approximately the best conditions in this respect for different soils, but it is certain that one very common cause of uneven samples of barley is uneven plant growth on closely contiguous areas of the same field. Birds, wire-worms, and other enemies destroy many young plants, and the consequence is that the remainder are unevenly distributed, and some have much more soil space than others.

Potatoes for Natal.

In a recent Report to the Board of Trade by Mr. A. Marsden, Chief of Customs in the East Africa Protectorate, it is stated that the potatoes imported into Durban are derived from Australia, Las Palmas and the Continent. The Continental supply is received from June to December, and fetch from £9 4s. to £11 18s. per ton. They are preferred packed in cases of 75 lb. each, made of half-inch board, three-quarters of an inch apart. The case measures about 2 ft. 5 in. long, 1 ft. $3\frac{1}{2}$ in. broad, and a little over 7 in. deep. The sides are made of two boards, the top and bottom of three; a light iron band is nailed round each end of the case.

The demand for seed potatoes commences in the beginning of August, and continues until the middle of February. The size of a seed potato should not be larger than a medium hen's egg, and as far as possible of an even grade throughout the case. Great care should be exercised in seeing that all tubers, either seed or otherwise, are matured and fit to travel, thereby insuring good delivery. The "kidney" variety is preferred to the round variety, and a potato which will hold together after being cut, owing to the amount of starch in it, is most suitable. Extreme size in a potato does not necessarily imply good quality. As a rule a medium size kidney potato is preferred.

Exporters should be careful to send two invoices with each

shipment, one showing the f.o.b. (free on board) price at port of shipment, and another the c.i.f. (cost, insurance and freight), or otherwise duty will be charged on the latter price instead of on the former. This applies to all produce, and to other ports as well as Durban.

Origin of Parasitism in Fungi.

Mr. George Massee, a Principal Assistant in the Herbarium of the Royal Botanic Gardens, Kew, has contributed to the Philosophical Transactions of the Royal Society of London an interesting account of investigations that he has carried out on the origin of parasitism in fungi. The research also throws much light on the factors that determine the immunity of certain species of plants and even individuals to the attack of specific fungi. It is well known that certain parasitic fungi have the power of attacking with ease definite crops, whereas they have no power to enter the tissues of other crops, even though they be closely related. It has also been found that even varieties of some particular species of plant may be resistant to the inroads of a parasite, while other varieties may at once succumb. For example, some wheats are much more resistant to rust than others, while during the past few years varieties of turnip have been raised which have special power of resistance to the attack of the parasite that causes "finger and toe." This immunity or comparative immunity has attracted the attention of many scientific workers, and now Mr. Massee claims to have discovered its cause. Formerly it was held that an individual plant was liable to invasion by a fungus, or not, according to the condition of the atmosphere at any particular time, or owing to the special development of the cuticle covering the leaves or stem. Should the latter be specially strong, then it was believed that the fungus might find it impossible to enter; on the other hand, if the cuticle was specially thin, the fungus would have little difficulty in effecting an entrance. Mr. Massee's researches, however, go to show that small differences in character of the sap of the plant are probably the main determining causes as to whether the fungus shall be able to

gain an entrance. As a general rule it was found that if a weak solution of sugar was introduced beneath the skin of the leaf, and if the spores of our commoner parasitic fungi were distributed on the patch so treated, the fungus had the power of entering and living on the sugary solution, and eventually of attacking adjoining tissues. If, on the other hand, a weak solution of acids was introduced, the fungus as a rule showed no disposition to enter. Certain fungi are purely saprophytic, that is to say, can only live on dead vegetable matter ; and yet by gradually accustoming them to push their tubes into living plants by injecting a substance by which the fungus is attracted, Mr. Massee has been able to "educate" such fungi into becoming parasites, that is to say, fungi capable of attacking living plants. He comes to the conclusion that all parasites have developed from saprophytes, and that it is quite possible for a harmless fungus living on dead vegetable matter to acquire the habit of living on growing plants. As a case in point he cites the fungus *Dendryphium comosum*, which, until recently, appears to have been quite unable to attack living plants, but which, aided by the unnatural conditions under which certain glass-house crops are now grown, has been found to attack in a serious manner young cucumbers.

Although the subject of inducing saprophytes to become parasites is one that has but little interest for the practical farmer or gardener, the case is different where the problem is attacked by the botanist from the other side. Reference has already been made to the result of "educating" turnips and wheat to resist certain diseases, and we also know that certain varieties of potato are much more resistant to the attack of the parasite that produces potato disease than others ; in fact, immunity to disease is a matter constantly in the minds of the raisers of new kinds of potatoes.

Doubtless there is a great field open to scientific work in this direction, and it is a subject that interests the forester as well as the farmer and gardener. Although the task of producing a tree which shall prove resistant to the attack of some disease must proceed much more slowly than in the case of an annual or herbaceous plant, still it seems not to be beyond the bounds of possibility that one day we may find our-

selves in possession of a variety of the common larch which will prove immune to the attack of the well-known "Larch Canker."

Wheat Fungus. (*Ophiobolus graminis.*)

The Department of Agriculture, Victoria, have issued a Bulletin (No. 9) containing an interesting account of a fungus disease of the wheat plant which has from time to time materially affected the crops in that division of Australia. Until quite recently there have been recognised by the practical farmer of Victoria two distinct ailments of the wheat plant. One of these, known as "Take-all," arrested the plants in their early growth, leaving in a short time large areas of miserable stunted specimens, dying off at various stages while still in the blade. Then, as the season advanced and the ears began to appear, it was found that wheat-plants which promised well and had fully-formed heads did not develop grain, or, if they did, it was shrivelled and almost valueless. These latter plants were not only dead at the top, but from the root upwards, and, having a bleached appearance, the name of "White-heads" was given to this disease.

The true nature of either of these diseases was not known, and it is, therefore, not surprising that various causes, such as bad seed, want of some constituent in the soil, nematode worms (which seem to be an accompaniment of the diseases in certain cases), weeds, &c., were assigned to them.

Both diseases have recently been discovered to be due to an ascomycetous fungus (*Ophiobolus graminis*), and are simply different periods in its life history. The actual stage at which the plant succumbs depends upon its general health and environments, and its ability in consequence to resist the fungus.

The disease was somewhat prevalent in this country some thirty years ago, and was known by farmers as "Straw blight" and also as "Root-falling." It is also known on the Continent and in America, and the black appearance of the root has

resulted in its being designated in France "Foot-rot." Little success has yet been achieved in preventing this disease. Dressings of Thomas sulphate and sulphate of iron respectively seem to have met with some success here and there. The method of starving the disease is the one just now recommended.

In connection with this latter point it is interesting to note that the oat plant is not attacked by the fungus, whilst, on the other hand, a very well-known grass, Sterile Brome, a distinct weed, is, and will therefore harbour the pest unless it is carefully destroyed. The disease is more of educational than practical interest to this country. A description of the fungus is given in an article by Mr. Carruthers, F.R.S., in the *Journal of the Royal Agricultural Society*, 1872.

Charlock Spraying.*

The Edinburgh and East of Scotland College of Agriculture have recently issued a report on the charlock-spraying demonstrations which were carried out by the College in 1902 and 1903 on 24 farms in various counties in the South of Scotland. Six or more acres were sprayed at each centre, and the convincing results obtained induced several farmers to arrange for this area being extended in some cases to as much as 20 acres. Altogether several hundred acres were sprayed under the supervision of the College staff. The dressing employed was 50 gallons per acre of a 3 per cent. solution of copper sulphate, guaranteed not less than 98 per cent. purity. This solution, it is observed, can easily be made by anyone by adopting the following simple rule:—A gallon of water weighs 10 lb., 10 gallons of water weigh 100 lb., and 3 lb. of copper sulphate added to this give approximately a 3 per cent. solution; to make sufficient fluid for an acre, 15 lb. of copper sulphate should be mixed in 50 gallons of clean water.

It was intended in these demonstrations to spray as soon as

* A description of the methods to be adopted for the destruction of charlock are given in the Board's leaflet, No. 63.

the charlock entered into the rough blade, or when the plants were about the size of turnips ready for singling, but, as a matter of fact, it was done on charlock at all stages of growth. This was necessitated by several of the days originally arranged turning out quite unsuitable for spraying. A calm day is necessary for success, when the fine spray descends naturally on the outspread leaves of the charlock, and a minimum of it falls on the upright corn blades. Whereas with wind, besides uneven distribution, the spray is carried in a horizontal direction, so that the greater part of it is caught by the waving corn and very little of it by the plant for which it is intended. Rain is equally undesirable, for it either materially weakens the solution or washes it off the plants entirely.

At a few of the centres the demonstrations were proceeded with although the conditions were not all that could be desired, but to avoid disappointment and waste of money the operation should be undertaken only when the weather appears settled, on a calm day—sunless, if possible—and when the majority of the plants are just in the rough leaf. With regard to the time when spraying is most effective, it was found that no necessary relation existed between the size of the plant and the stage when it could be most easily destroyed. In cold, backward seasons, such as 1902 and 1903, and on poor or exposed lands, it is not unusual to find charlock coming into flower while less than 3 inches in height. Such charlock is slow grown, stunted, hard and wiry, and much more difficult to kill than when the plant is young and succulent. Cases of this kind were successfully met by making the fluid 4 instead of 3 per cent., but experience showed that charlock is most successfully and economically eradicated by spraying when the plant is young, succulent, and in the rough leaf. One spraying in favourable circumstances will kill the charlock, but this is entirely dependent on its being properly done under suitable climatic conditions; and two sprayings within ten days of each other may, in certain circumstances, be required to completely eradicate charlock from a growing corn crop.

Report of the Animals Division.

This volume* contains a review of the proceedings of the Animals Division of the Board in the form of Reports by the Chief Veterinary Officer and by the Assistant Secretary in charge of that division.

The Chief Veterinary Officer, in the opening paragraph of his Report, observes that there is some satisfaction in being able to congratulate the owners of stock on the entire freedom from such diseases as the cattle plague, pleuro-pneumonia, and foot-and-mouth disease, while the public may also find some consolation in knowing that rabies in dogs, which for many years had annually caused the death of numbers of human beings from hydrophobia, no longer exists in this country. These results have been achieved partly by the application by the Board of those extended powers granted by Parliament for preventing the introduction of disease from without, but chiefly by the prompt and decisive measures adopted for stamping out the diseases mentioned.

In order to appreciate the advantages, economic and otherwise, which the owners of stock and all persons connected with the trade in animals have obtained by the extirpation of these diseases, Mr. Cope points out that it is necessary to consider the extent to which they at various periods have prevailed in this country, and his Report contains a review of the history of cattle plague, pleuro-pneumonia, foot-and-mouth disease, and rabies during the last half of the past century.

With reference to the increase in the number of outbreaks of glanders which took place in 1903, Mr. Cope draws attention to the fact that the application of the mallein test is now accepted to be so reliable that in many of the large horse-keeping establishments in London, glanders has been eradicated from the studs by the slaughter of every animal which reacts, and what is still more important, these studs have been kept practically free from glanders by rejecting every horse that reacts before it is introduced into the stud. This, it is observed, is a material fact which cannot be ignored, and is founded upon such a sound basis that if the system could be applied to all suspected horses throughout the country glanders

* *Annual Reports of Proceedings of the Board of Agriculture and Fisheries under the Diseases of Animals Acts, &c., for* 1903. [*Cd.* 2006.] Price 11d.

would, like many other contagious diseases which were once prevalent, become unknown, unless it were to be reintroduced from abroad. But even admitting that the disease might be reintroduced, it could be kept within very small limits by a frequent and general inspection of studs by the Veterinary Inspectors of the Local Authorities and the application of the mallein test to all suspected studs.

The Report of the Assistant Secretary deals more particularly with the steps taken during the year for carrying out the provisions of the Diseases of Animals Acts, and attention is drawn to the fact that, so far as regards the diseases, the administration of which is more directly undertaken by the Central Authority, the position at the close of 1903 was unprecedented. No case of cattle plague, pleuro-pneumonia, sheep pox, foot-and-mouth disease, or of rabies was recorded during the year, whilst the outbreaks of swine fever were materially reduced, and stood at a figure lower than that of any previous year.

The same could not, unfortunately, be said of the diseases which have hitherto been dealt with by Local Authorities with little or no direct intervention on the part of the Central Authority. The returns of outbreaks of sheep scab show an increase as compared with 1902 of 169 cases; of anthrax, an increase of 88 cases; and of glanders, an increase of 301 cases.

The conclusion drawn from these facts is that a more effective control of contagious diseases in animals is secured by Central than by Local Administration, and that direct supervision on the part of the Central Authority is a necessary supplement to the action of the Local Authority. This is the more clearly demonstrated where the Local Authority concerned is that of an urban district. The action of such an Authority is almost of necessity limited in its scope, and even where there is a desire to do so the means are often lacking for following the disease to its source in the district of another Local Authority Attention is concentrated upon the outbreak as it affects the interests of the particular town, and then the matter is apt to be dropped. The attention of the Central Authority, on the other hand, is primarily directed to the discovery of the source of the disease in whatever district it may have originated,

and they have at their disposal means of rapid and effective administrative action. As a result of enquiries made by their inspectors, they are often enabled to bring to the knowledge of another Local Authority the existence of an entirely unknown centre of disease in the district of that Authority, and thereby to assist in the detection and elimination of disease.

The condition of affairs as regards the various contagious diseases dealt with in this Report enforces, it is stated, the conclusion to which the Board had previously arrived—namely, that it is desirable that they should be in a position to supervise more closely than has hitherto been possible, the local administration as regards all the diseases in animals through the agency of their own staff of inspectors, whose experience and advice would be at the disposal of Local Authorities, and who in many instances would be in a position to take a more general view of the aspects of particular outbreaks as affecting other localities.

The Report contains a detailed account of the steps taken during the year in regard to swine fever, and the distribution of this disease in the various counties in Great Britain during 1901, 1902, and 1903, is depicted on three coloured maps. The position in regard to sheep scab is similarly illustrated, and detailed tables are given showing the quarterly number of outbreaks of both these diseases in each county of Great Britain in 1902 and 1903.

The statistical tables which are included in the volume relate to the number of animals in Great Britain and the number imported, and to the imports and exports of cattle, sheep, and swine of the principal countries of the world.

Notice to Stock Owners in regard to Anthrax.

The Board have issued the following notice to stock owners indicating the general symptoms of anthrax and the measures which should be taken to prevent the spilling of the blood of the diseased or suspected animal and the consequent risk of the spread of infection :—

Every person having or having had in his possession or

under his charge an animal affected with, or suspected of, anthrax is required by law to give notice of the fact with all practical speed to the police.

Failure to give such notice renders a person liable to a fine of £20, and in certain circumstances to a month's imprisonment with hard labour.

Where an animal is attacked with anthrax its inclination is to separate itself from its companions. It stands almost immovable, with head depressed, and usually declines every kind of food. If carefully watched, rigors, or shivers, will be seen to pass over the body; there may be swellings (around the throat) which are extremely hot to the touch, the eyes have a fixed and staring look, and if carefully examined, a small quantity of blood may sometimes be found trickling from the nose, or upon the voided fæces of the living animal, and death follows as a rule very rapidly after these symptoms are observed. Cattle are peculiarly susceptible to this disease.

In all cases where an animal is found to have died suddenly from an unknown cause it is most important that the carcase should in no circumstances be cut, until it has been determined that the animal did not die of anthrax. If the carcase were to be skinned or cut up, there would be a very great risk of communicating the disease, through the agency of the blood of the diseased animal, not only to other animals on the farm or on other premises where the animal may have died, but even to any persons who handled the carcase.

Where an animal dies of anthrax there is generally to be found, almost directly after death, a slight oozing of blood from the nostrils or some other of the external openings of the body. Such blood should at once be destroyed, and also any drops of blood which may have escaped from the carcase to the floor of the shed or to the soil, inasmuch as every drop of blood of an animal which died of anthrax contains large numbers of the spores which cause the disease. For the purpose of destroying the spores contained within the infected blood a strong solution of carbolic acid should be used, and all the external openings should be plugged with hay saturated with the same solution.

After these directions have been carried out, care should be

taken to prevent any animal from approaching the carcase or the place where the animal has died until the officers of the Local Authority arrive and prepare for the disposal by burial, or otherwise, of the carcase, without cost to the owner.

A leaflet, No. 28, on anthrax can be obtained, gratis and post free, from the Board.

Report of the Royal Commission on Tuberculosis.

In their Interim Report, which has recently been issued, the Commissioners state that the first inquiry undertaken by them was to ascertain what were the effects produced by introducing into the body of the bovine animal tuberculous material of human origin, and how far these effects resembled or differed from the effects produced by introducing into bovine animals, under conditions as similar as possible, tuberculous material of bovine origin. Use has been made up to the present of more than twenty different "strains" of tuberculous material of human origin. In the case of seven of these strains the introduction of the human tuberculous material into cattle gave rise at once to acute tuberculosis, with the development of widespread disease in various organs of the body, such as the lungs, spleen, liver, lymphatic glands, &c. In some instances the disease was of remarkable severity.

In the case of the remaining strains, the bovine animal into which the tuberculous material was first introduced was affected to a less extent. The tuberculous disease was either limited to the spot where the material was introduced (this occurred, however, in two instances only, and these at the very beginning of the inquiry), or spread to a variable extent from the seat of inoculation along the lymphatic glands, with, at most, the appearance of a very small amount of tubercle in such organs as the lungs and spleen. Yet tuberculous material taken from the bovine animal thus affected, and introduced successively into other bovine animals, or into guinea-pigs from which bovine animals were subsequently inoculated, has, up to the present, in the case of five of these remaining strains, ultimately given rise in the bovine animal to general tuberculosis of an intense

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character. Observations in this direction are still being carried out.

The Commission state that they have very carefully compared the disease thus set up in the bovine animal by material of human origin with that set up in the bovine animal by material of bovine origin, and, so far, they have found the one, both in its broad general features and in its finer histological details, to be identical with the other. They have so far failed to discover any character by which they could distinguish the one from the other ; and their records contain accounts of the post-mortem examinations of bovine animals infected with tuberculous material of human origin, which might be used as typical descriptions of ordinary bovine tuberculosis.

The result thus arrived at, namely, that tubercle of human origin can give rise in the bovine animal to tuberculosis identical with ordinary bovine tuberculosis, seems, the Commission observe, to show quite clearly that it would be most unwise to frame or modify legislative measures in accordance with the view that human and bovine tubercle bacilli are specifically different from each other, and that the disease caused by the one is a wholly different thing from the disease caused by the other.

[*Interim Report. Cd.* 2092. Price 1d.]

Tuberculin Test in Canada.

The system adopted by the Canadian Government by which stock exported from this country to Canada was tested by the tuberculin test by an officer of the Canadian Department of Agriculture stationed at Glasgow,* has now been discontinued, and the cattle quarantine regulations provide that cattle six months old or over imported from countries other than the United States or Mexico shall not be discharged from quarantine in Canada until they have been submitted to the tuberculin test by a duly authorised officer. Cattle reacting to the tuberculin test, but not showing clinical symptoms, shall be permanently marked in the right ear with the letter "T," and may then be released at

* *Journal*, Vol. VIII., June, 1901, p. 99; Vol. IX., June, 1902, p. 109; Vol. X., September, 1903, p. 261.

the expiry of the prescribed period of quarantine if found free from all other infectious or contagious disease. Cattle showing clinical symptoms of tuberculosis shall be destroyed or otherwise disposed of as may be directed by the Minister for Agriculture.

Prevention of Animal Diseases in United States.

A Report of the Committee of the United States Senate on Agriculture and Forestry, dated February 15th, 1904, gives the following account of the work of the Bureau of Animal Industry, which is the section of the Department of Agriculture established for the purposes of carrying out the laws as to diseases of animals. The grant for the Bureau in 1903-4 was about £268,000, of which some £165,000 was spent on the inspection of meat and live animals for slaughter. The number of animals inspected before and at the time of slaughter was 37 millions, and their meat was marked and certified, and the packages containing meats stamped for identification. Carcases of hogs to the number of 490,000 were also inspected microscopically for the foreign market. The result of the inspection was the destruction of some 78,000 carcases affected by disease or otherwise unwholesome and unfit for consumption.

Cattle, sheep and horses intended for export were inspected before leaving the United States, and a reinspection was also carried out at British ports at the time of landing. The inspection of the vessels participating in this trade, and the requirement of proper fittings, ventilation and care, has resulted, it is stated, in a decrease in the losses during transit; and the rate of insurance which, when the inspection was first undertaken, was 8 per cent. has been reduced to less than one-half per cent.

In order to prevent the introduction of contagious disease, animals imported from Canada and Mexico were inspected, and in the past year a considerable expenditure was incurred in stamping out foot-and-mouth disease, which had obtained a footing in the New England States. Sheep scab is another disease dealt with by the Bureau, and it is stated that it is now being controlled and rapidly eradicated. Success has also

attended the efforts of the Bureau in dealing with Texas fever and other diseases.

Judging at Shows in Canada.

There are throughout Canada a large number of agricultural societies and farmers' clubs, the majority of which have done no work beyond holding an annual show. As one means towards improvement an effort was made in 1901 by the Canadian Department of Agriculture to inaugurate a better system of conducting county and township fairs. A number of fairs were arranged in a circuit, and expert judges furnished by the Department for the live stock classes. These expert judges explained the reasons for their decisions in the ring and gave addresses on the best types of horses, cattle sheep and swine. This plan proved so satisfactory that a great extension of the movement has now taken place, and in 1903 judges were sent to all the Provinces in the Dominion. In Ontario the system of judging and giving publicly the reasons for the awards is extended also to fruit and poultry.

Live Stock in New Zealand.

A supplement to the *New Zealand Gazette* dated February 18th, 1904, gives the following particulars as to the number of live stock in the Colony during the past five years :—

Year.	Horses.	Cattle.	Sheep.	Pigs.
	No.	No.	No.	No.
1899 ...	262,390	1,222,139	19,348,506	249,751
1900 ...	266,725	1,256,680	19,355,195	250,975
1901 ...	280,078	1,361,784	20,233,099	224,024
1902 ..	287,419	1,460,663	20,342,727	193,740
1903 ...	299,182	1,593,547	18,954,553	226,591

Both horses and cattle have steadily increased during the whole period, but the number of sheep in 1903 showed a decrease of 1,388,000 compared with the previous year.

British Pedigree Cattle in Greece.

H.M. Consul at the Piræus reports that an interesting breeding experiment has been undertaken in his district. The Copais Company has imported four British pedigree bulls, viz., two of the Devon breed for crossing with the cattle of the Greek islands, and two Galloways for crossing with native cattle on the mainland and in Macedonia. Two Berkshire boars have also been imported with a view to improve the native breed of pigs. All these imported animals have now been in Greece for about a year, and they have stood the climate well.

[*Foreign Office Report*, *Annual Series*, *No.* 3,166.]

Importation of Horses into Jersey.

The Board are officially informed that all horses imported into Jersey will in future be required to be examined by the Veterinary Officer before disembarkation, and that the importer must furnish the Harbour Master or his representative with a certificate of the health of the horses, signed by a duly qualified veterinary surgeon, before disembarkation will be allowed.

Muscular Development of the Jaw in Animals.

Dr. Bieler, of Lausanne, has recently published in the *Chronique Agricole du Canton Vaude* an article in which he gives his views with regard to the possibility of distinguishing the individual calves which are likely to develop into satisfactory beef or milk cattle. As a result of a large number of observations, he has come to the conclusion that, in the case of ruminating animals, a capacity to fatten and to make the most of food is intimately associated with large development of the lower jaw, and especially with width in the hinder part of the jaw. Such development, he says, is associated with strength and size of the muscles in that region, and this condition is conducive to good mastication and, therefore, to good digestion. He

instances our English breeds of pig to illustrate his point. These breeds are the most highly developed in the world, and have greater capacity for laying on flesh than any others ; and he points out that they are distinguished by the great breadth of the back part of the lower jaw ; this is also the case with our best breeds of fattening cattle. He further points out that calves which get their milk from the pail have not the same need for using the muscles of their jaws as calves which get their milk from the teat, or from some artificial sucking apparatus. He is therefore convinced that it is irrational to raise calves "on the pail," because, owing to the poor development of the muscles of the lower jaw, they will ultimately prove thriftless cattle.

These theories of Bieler's are possibly new to English breeders, and will require to be very carefully put to the test of practice and experience before being adopted. But there may be something in the suggestion, and it would be well to keep the matter under observation.

Milk Investigations at Garforth.

During the past few years experiments have been conducted at the Yorkshire College Farm at Garforth, near Leeds, with a view to determine the chief factors which influence the quantity and quality of the milk secretion of cows. Reports on the variations observed in the composition of the milk, and on the results obtained, have been issued at intervals by the Yorkshire College and the Yorkshire Council for Agricultural Education. Other valuable contributions on the subject have been published in the last four annual volumes of the Highland and Agricultural Society of Scotland. The recently issued Transactions of the Society* contain an article by Dr. Charles Crowther, Lecturer in Agricultural Chemistry in the Yorkshire College, regarding the investigations at Garforth in 1903. The following summary of the observations made during the previous three years is also given :— (*a*) The proportion of fat in the milk of individual cows is

* *Highland and Agricultural Society Transactions*, Vol. XVI., Fifth Series, p. 268.

liable to enormous variation from time to time from causes which are unknown. (*b*) The proportion of solids-not-fat is fairly constant in the milk of any individual cow, but varies much with different animals. (*c*) The yield in the morning is greater than that in the evening. Morning milk, further, is much poorer in fat, but usually slightly richer in solids-not-fat than evening milk. The differences are, however, very considerably less when the intervals between consecutive milkings are equal. (*d*) The mixed morning milk of a dairy Shorthorn herd may often contain less than 3 per cent. of fat during summer or early autumn if the milking be performed at the usual unequal intervals. (*e*) Provided the cows are receiving liberal rations, variations in the nature of the food supplied have little influence on the milk secretion. So far as any change is effected, it would appear that foods rich in albuminoids (*e.g.*, gluten meal) slightly improve both the yield of milk and the proportion of fat and solids-not-fat, at least for a time; whilst large quantities of carbohydrates, though increasing the yield somewhat, cause a slight deterioration in quality. (*f*) Concentrated food supplied liberally in the morning increases the fat-content of the morning milk. (*g*) Milk secreted in different portions of the udder may differ considerably in composition, both in fat and solids-not-fat, the variations being most significant in the case of the latter, since the lowest proportion was generally found in the milk yielded by one particular quarter—the left fore-quarter.

In accordance with the foregoing results, Dr. Crowther is of opinion that an improvement in the quality of the morning milk can be effected mainly by (1) equalising the periods between successive milkings, and (2) by supplying concentrated, highly nitrogenous food liberally at the morning meal. The first of these alternatives is stated to be decidedly the more effective, and it should be adopted wherever possible.

The more recent investigations refer particularly to the enriching influence of highly nitrogenous food, and to the effect on the milk secretion of distributing the concentrated food between the morning and evening meals. Full details of the experiments are given in the Transactions, which also contain tabular statements and diagrams explaining the work in

detail. The general conclusions drawn by Dr. Crowther are as follows :—

(1) Change from a highly nitrogenous diet to one relatively poor in nitrogen causes secretion of a greater quantity of milk, but of milk rather poorer in fat—the change in the fat-content being much more pronounced in the morning than in the evening milk. Presumably, therefore, the reverse change—*i.e.*, from a diet poor in nitrogen to one relatively rich in nitrogenous constituents—would effect an improvement in the quality of the milk, though accompanied by a relative decrease in the yield, as indeed was found to be the case by direct experiment. (2) Concentrated food given only in the morning tends to increase the fat-content of the *morning* milk, but there is apparently no analogous improvement in the evening milk. (Dr. Crowther here states that the conclusions drawn from the experiments in 1901 and 1902 are thus fully confirmed.) (3) Concentrated food given only in the evening also tends to increase the fat-content of the morning milk, but has apparently little or no effect on the evening milk. (4) The above-mentioned changes are not of a pronouncedly temporary nature, since they persist without appreciable diminution for fully five weeks after the change of treatment. (5) The effects of sexual excitement are, as a rule, most pronounced on the milk-yield, which, in general, at first shows a marked diminution, followed usually at the next milking by a yield well above the average. The fat-content is usually at first considerably diminished, but at the following milking is sometimes abnormally high, sometimes abnormally low. The fat-content of the milk yielded on the two or three days immediately preceding the outward manifestation of sexual excitement is in nearly every case decidedly above the average. In most cases the disturbing effect is not appreciable after two, or at the most three, succeeding milkings. Results at variance with these conclusions were, however, obtained with a few cows. (6) Provided the milking be satisfactorily performed, the individuality of the milker has no appreciable influence on the milk-yield or the quality of the milk. (7) The influence of climate apparently varies considerably with different cows. The change from an equable to either a decidedly low or a decidedly high temperature tends in the

majority of cases to induce secretion of milk poorer in fat. When cows are at pasture the first effect of a fall of rain is probably—with most cows—to cause secretion of richer milk (especially in the case of morning milk yielded after a rainy night), this being perhaps attributable mainly to the increased succulence of the grass. The influences are only of a very temporary nature, the return to normal conditions being fairly rapid with a continuance of fairly uniform climatic conditions. (8) The average percentage of fat in the morning milk yielded by the Garforth herd during the summer months was on most days below 3 per cent. The herd is not peculiar in this respect, as similar results have been obtained with other herds in different parts of the country.

Keeping Quality of Canned Butter.

The United States Department of Agriculture are investigating the keeping qualities of butter, and in Bulletin No. 57 of the Bureau of Animal Industry they have issued a report upon canned butter. Such butter is put up when perfectly fresh, more especially if intended for use in warm climates, into small cans, which are hermetically sealed. Nevertheless, the butter does not keep indefinitely. This is said to be due to certain yeasts, which may produce a slow development of acidity under particular circumstances, and to the action of an enzyme, although the aerobic forms which cause rapid increase of acidity cannot develope. The conclusion is that the milk or cream should first be pasteurised, as it is not sufficient to seal the cans hermetically in order to kill these yeasts.

Coating Cheese with Paraffin Wax.

The following results of experiments with cheese kept under ordinary conditions in a Melbourne warehouse have recently been published in the *Journal of Agriculture* of Victoria :—Four small cheeses, weighing 46¼ lb., were coated with paraffin wax on October 8th, 1903, and four duplicates of the same weight were left

uncoated. The minimum temperature of the store for $14\frac{1}{2}$ weeks was 58 degrees, whilst the maximum was 70 degrees, and the mean 65 degrees. On January 19th, 1904, the cheeses coated with wax weighed $44\frac{3}{4}$ lb., showing a loss of $1\frac{1}{2}$ lb., or 3·22 per cent., whilst the plain duplicates weighed $43\frac{1}{2}$ lb., and lost $2\frac{3}{4}$ lb., or 5·91 per cent., showing a saving of 2·69 per cent. in weight in favour of the paraffin coating. The cheeses coated with wax were adjudged by experts to be superior in flavour and texture to those which were not so treated.

The Shoot and Fruit Moth of Red and Black Currants.

This little moth, *Incurvaria* (*Tinea*, Cl.) *capitella*, Fab., which is related to the raspberry moth (*Lampronia rubiella*),* is one of a section the members of which show considerable variations in life history, the caterpillars of some feeding exposed on leaves, others mining in leaves, and still others feeding at one stage of their life on one part of the plant and in another stage on a different part of the plant. The *Incurvaria capitella* behaves in the last mentioned way, feeeding in the young stage in the currants, and completing its growth in the buds and young shoots of the currant tree.

The moth measures in length about half an inch, and in spread of fore-wings over half an inch. The head is deep yellow in colour ; the fore-wings dark brown, with a slight purple tinge. Less than half-way from the base of each fore-wing is a pale yellow band running from the hind margin to the front margin ; nearer the outside border on each fore-wing are two light yellow spots. The hind-wings are purple grey, and these and the outer margins of the fore-wings are finely ciliated. The moth has been found in the North of Ireland, and in England as far north as York and Manchester.

The young caterpillar on issuing from the currant fruit previous to its hibernation is extremely small ; it is reddish or greenish-yellow in colour, and with the characteristic sixteen legs of a moth caterpillar; the four pairs of abdominal or middle legs are without hooks. The grown caterpillar found in the buds

* Leaflet No. 14.

and shoots has hooks on the abdominal legs. The head is dark, and the next segment has a dark plate ; there are hairs on the head and the various segments.

We owe our knowledge of the stages of its life history, from the adult to the appearance of the caterpillars in the shoots, to Dr. A. T. Chapman. The moths may be found in May flying in the near neighbourhood of the currant bushes. The females lay their whitish lemon-shaped eggs in the young currant fruit, and the caterpillars on hatching feed on the seed. More than one caterpillar may be present in a single fruit. After feeding for a time the caterpillar, still very small and far from having completed its growth, burrows out of the fruit in June and July and spins a white case, which is attached to old persistent bud scales and to bark. Protected by this case the caterpillar enters upon a resting period which lasts into the next spring, when the partly grown larva leaves its case and bores into the buds and tunnels the young shoots. Here it renews its feeding, and in April and the beginning of May completes its growth, the result of its presence being a non-development of the flower buds, and the withering, drooping, and death of the young shoots. The full-grown caterpillar passes into the chrysalis condition, and later the moths issue from the cocoon and proceed to pairing and egg laying.

Attacks are chiefly recorded upon red currant, but in 1896 Miss Ormerod chronicled an attack on a black currant.

As a preventive and remedial measure spraying with strong paraffin emulsion in the autumn or winter would possibly be successful in destroying the caterpillars sheltering in their cases, and hand-picking and burning the infested drooping shoots before the pests have escaped should be practised as a preventive against future infestation.

Snow Flies.

The snow flies (*Aleyrodes*) are small hemiptera which, when mature, look very like powdery moths. They are common pests under glass and in the open. They may be found all through the year, but occur in greatest abundance in the late summer and early autumn. When disturbed they rise in the

air, and soon settle down again nearly on the same spot. They rest mainly beneath the leaves, and suck out the sap, causing the leaves to turn brown in patches, or sometimes to assume a yellowish hue.

The eggs are laid on the under sides of leaves, and hatch out in about two weeks. The larvæ are at first active and spread over the leaves; later on they become covered with a pale scale, beneath which—in the cabbage snow fly (*Aleyrodes proletella*)—two yellow spots are noticeable. In ten days the larva turns into a pupa beneath the scale, and from this the winged snow fly appears in four days.

The adults, although they appear to be snow white, are not so when the down is rubbed off them; they are then seen to be black, with some yellow about them. They breed in winter as well as in summer.

The only method of treatment that can be suggested is spraying with paraffin emulsion, which would have to be done several times at about ten days' interval, as the wash could not be used of sufficient strength to destroy the scaly covering of the maturing larvæ and pupæ. The delicate snowy white flies would soon be killed by this wash, and also by the use of caustic alkali wash in winter. The method of making paraffin emulsion and caustic alkali wash is described in the two following articles.

Remedies for Apple Sucker.* (*Psylla mali.*)

The times when measures may be taken with best results against the apple sucker are in the early spring and the autumn. The first spraying should take place with paraffin emulsion just before bud bursting, when the eggs are hatching, and a second spraying should be undertaken after the hatching, and when the young leaves have unfolded from the bud, as at this time there would be a chance of reaching the larval psylla. It is possible that occasional lack of success with the spray may be due to the circumstance that the eggs have already hatched, and that the young have penetrated the bud

* An account of the apple sucker is given in the Board's leaflet, No. 16.

scales, and so are protected against the spray. Future benefit would almost certainly result from a spraying, after the fruit had been harvested, with paraffin emulsion, described under "Remedies for Red Spider," below. The fact that the spray starts the insects, which at this time are adult and able to fly, need not be regarded as discouraging. In experiments directed against the adult pear psylla in America, on account of the shyness and activity displayed by the insect, it was recorded that "spraying has practically no value against the insects in their active summer existence," but in spite of this there are several recorded successes with the paraffin emulsion spray against the pear psylla in its winged condition, one such report telling how in an infested pear orchard in New York State, "when the leaves were about to fall, the paraffin emulsion spray was directed against the enemy, with the result that it brought down millions of adults." Many adults would certainly escape by flight, but a second spraying would account for many of them.

The life history of the apple psylla shows that the winter is passed in the egg stage, and after egg laying has taken place in the autumn the following wash may be recommended for use in the winter (see leaflet 70):—Dissolve in water 1 lb. caustic soda (70 per cent.), add 1 lb. carbonate of potash (80 per cent.), and stir till dissolved; dissolve 10 oz. of soft soap in boiling water, and after adding to the above stir thoroughly. The whole should then be made up to 10 gallons with added water.

Remedies for Red Spider.

An account of the Red Spider or Spinning Mite (*Tetranychus* and *Bryobia*) is given in the Board's leaflet, No. 41, and as supplementing the information therein given, it is believed that the following remedies, if diligently practised, would be attended with success.

As mixtures for spraying:—(1) Boil 6 oz. of black soap in 1 quart of water for 15 minutes, then add 4 oz. of white soap in powder and boil for 15 minutes. Next pour a quart of paraffin into a pail, add the above, and stir thoroughly. This "stock" might be allowed to stand for a day or two, being stirred

or churned every now and then until a thick, buttery mass has resulted. For use dilute with water according to the strength of the plants to be treated, thus: 1 part of the stock to 10 parts of water for strong plants, 1 to 15 for not so strong plants, and 1 to 35 for tender plants. It is safer to syringe afterwards with cold water.

(2). A mixture of infusion of quassia chips and tobacco juice is also fairly satisfactory, but whatever spraying mixture is used—and a good douching with soap and water is often satisfactory—care must be taken that the application is thorough, and that the under sides of the leaves are not neglected.

Sulphur mixed with water, so that it can be painted on the hot water pipes, is often used in conservatories. In this use of sulphur care must be taken to maintain a proper moisture in the greenhouse. Apart from the danger of this treatment if the atmosphere be dry, one of the great causes of the prevalence and multiplication of red spider is overheating and over-dryness. Where "forcing" has to be done and the temperature is therefore high, attention must be paid to keeping a moist atmosphere. In cases where the above remedies are adopted, the Board will be glad to learn how far the suggested measures prove successful.

Cold Storage of Apples.

The investigations which are being carried out by the United States Department of Agriculture in regard to the cold storage of fruit and vegetables have been referred to in previous numbers of this *Journal*.* A report has now been issued on the cold storage of apples, a practice which is largely adopted in the United States and Canada, in order to extend the period during which the apples can be kept in good condition. The investigations tend to show that an apple should be fully grown and highly coloured when picked, in order to give it the best keeping and commercial qualities. An exception appears to exist in the case of certain varieties from rapidly growing young trees. Such fruit is likely to be over-

* *Journal*, Vol. IX., Mar., 1903, p. 516. Vol. X., Dec., 1903, p. 398.

grown, and the apples may need picking before they reach their highest colour and full development. Uniform colour may be secured by pruning, to let the sunlight into the tree, by checking the growth of the tree early in the autumn, and by picking the trees over several times, taking the apples in each picking that have attained the desired degree of colour and size. Apples should be stored as quickly as possible after picking. The fruit ripens rapidly after it is picked, especially if the weather is hot. The ripening which takes place between the time of picking and storage, shortens the life of the fruit in the storage house ; but if the weather is cool enough to prevent after-ripening, a delay in the storage of the fruit may not be injurious to its keeping quality. The investigations indicate that the ripening processes are delayed more in a temperature of 31° to 32° F. than in 35° to 36° F. The apple keeps longer in the lower temperature, moulds and other fungoid growths are prevented to a greater extent, the aroma, flavour and other characteristics of the fruit are fully as good, and when removed from storage it remains in good condition for a longer period. It was found that the wrapping of fruit in paper also retarded the ripening process, and prevented the spread of fungous spores from decayed fruit. Apples should be in a firm condition, and not over ripe, when taken from storage, and then should be kept in a cool place.

In some experiments * which were carried out in England by the Kent Technical Instruction Committee, it was found that the leading dessert apples could be kept in good condition for three to four months, and in some cases much longer, in a cold store, a temperature of 36° F. being, it was stated, found most suitable. Some experiments carried out by the Ontario Agricultural College,† however, support the conclusions of the United States Department, as it was found in the Canadian investigations that apples kept better at a temperature of 31° F. than at a higher temperature, and also when wrapped singly in paper and packed in shallow boxes holding not more than a bushel.

* *Journal*, Vol. VI., June, 1899, p. 86.

† Ontario Agricultural College, Report, 1902.

Forestry in Germany.

The results of the inquiry which was held into the area and production of forests in Germany in 1900 have been briefly referred to in this *Journal* (Vol. IX., p. 244, Vol. VI., p. 394), and in connection with the particulars therein given, some extracts from an article by Dr. Yentsch in the German official catalogue of the St. Louis Exhibition may be of interest. The variety of trees in Germany is, it is observed, not large, and among the numerous indigenous kinds which formerly existed only those have been preserved which possess a high economic value, chiefly oak and beech, among the hardwood trees. Trees are grown for bark in the tall timber woods and plantations on the lower Rhine and in Westphalia; their cultivation is, however, declining, both because the ground suitable for them is being devoted more and more to agriculture, and also on account of the low prices for tanning-bark, but they are still grown abundantly in mixed woods along with fir and beech trees, chiefly in West and South Germany. The beech, formerly much grown for fuel, has, with the spread of coal-mining, almost entirely lost its importance, and is more and more displaced by the better paying conifer. It is most widespread in West Germany and in the chalk-ground of the South German mountains, and is, moreover, abundantly represented in the north, especially on the shores of the Baltic from Schleswig-Holstein to Pomerania. Where it is cultivated on account of its good forest qualities, oak, maple, and ash, as well as conifers, are grown along with it, and in many places also horn-beam, elm and such soft woods as aspen, poplar, and occasionally lime. The unpretending birch is seen everywhere, while the alder is cultivated as underwood in damp low ground. The total area covered by foliage trees amounts to 11·1 million acres, or 32·5 per cent. of the whole forest area, 67·5 per cent. or 23·5 million acres being covered with conifers. The most important species of the latter are the fir and pine, and in South-West Germany the pitch-pine, mixed with larch. The fir (*Pinus sylvestris*, L.), the chief species of wood in the sandy plain, covers 13·8 million acres. It thrives best in the dry districts of North-East Germany (the East Prussian fir being highly valued), but it flourishes also in those districts which have a considerable rainfall, *i.e.*, in the West and on the plateaux

of Central Germany from Nuremberg to the Palatinate. With careful treatment it yields great quantities of wood, even in the hill and mountain country, although generally of inferior value. According to the locality beech and oak, pine and larch, birch and soft woods are frequently grown with it. The pine (*Picea excelsa*, Lk.) forms the great forests which cover the mountains of Middle and Southern Germany, but from ancient times it has also been a native of the plains of East Prussia, Silesia, and Hanover. It covers 6·2 million acres, and is likely to increase, as it is hardy, easily cultivated, gives a high yield of timber in a relatively short time, and is, therefore, preferred in new afforestation and as a substitute for the economically inferior foliage tree. The pitch-pine is usually grown in the Black Forest and the Vosges, but occurs everywhere in mixed woods except in the north-east. It occupies an area of three-quarters of a million acres. The larch is everywhere found mixed with the chief species of wood, mostly in the mountains, where it is at its best.

Of the typical kinds of forestry, tall timber (high forest) predominates throughout; about 27 million acres, or 78·5 per cent., being thus planted. Bare clearing with artificial renewal is the general rule for fir and pine, seeding-in with natural renewal for foliage trees and pitch-pine. The cultivation of tall timber demands long periods of management, great areas of cultivation, systematic arrangement and constant care, but yields most wood, and is the most valuable per acre. Low woods cover only 3·5 million acres. They permit of the permanent cultivation of a small area, but yield smaller quantities and less valuable wood. They are to be found in the small estates of Westphalia and the Rhine, and, as far as conifers are concerned, in the east. Middle-sized timber is more sparsely represented, as it amounts only to 5 per cent.

The yields are greatest in the tall timber woods, in conifer woods, and in the State forests; smallest in the low woods and in independent private forests. The total production will probably gradually increase, because continued afforestation is taking place and the cultivation of tall conifers is extending. At present younger trees are the most prevalent in the conifer high wood, 48 per cent. of the area being of under 40 years' growth, 33 per cent. from 41 to 80 years' growth, and the

remainder over 80 years. In the foliage wood, on the other hand, these three grades are approximately equally divided.

According to the statistics of 1900, the German forests produce annually about 20 million cubic metres* of timber and 18 million c.m. of firewood, making a total of 38 million c.m. of solid wood, or wood of over 7 centimetres' diameter, in addition to 10 million c.m. of loppings and roots and 135,000 c.m. (about 98,400 tons) of oak bark and 101,000 c.m. of osiers.

The pine forests in Saxony and Thuringia attain the highest average yield of timber; the beech forests the lowest. The State forests, with 32 per cent. of the area, yield 43·5 per cent. of the whole timber and 40 per cent. of the total solid wood products; the independent private forests, on the other hand, with 36 per cent. of the area, yield only 26·6 per cent. of the total products.

By far the greater part of the German forests is regulated and subjected to a systematically ordered administration, the underlying principle of which is to fell only as much wood annually as is renewed in the growth. This aims at bringing the increase of valuable wood to a maximum. For this purpose different scientific and practically tested methods are employed. Those species of trees are grown which, in each locality, are of the greatest economic value. Besides woods of only one species, the planting and formation of mixed forests is attempted. The principal methods are thinning in the earlier stages (the age of thickening), and in the older (pole timber) stage, and clearing in the advanced (timber wood) stage, and by the removal of badly grown, malformed, and valueless trees. Strong and well-formed timber is thus continually produced, and at the same time a yield is obtained preceding the main crop. The instruction in thinning has been especially developed latterly in various directions and brought more into practice.

These methods are only practicable when those who are to carry them out have been well and scientifically trained in the practice and theory of forestry. To do this has been one of the first cares of the forest authorities of the Federal States in the interests of their forest economy. Several high schools exist where the future State forestry officials are educated, which

* 1 cubic metre = 35·317 cubic feet

at the same time have become centres for the advancement and development of forestry and the auxiliary sciences. The teaching of forestry is carried on in Prussia at Eberswalde and Munden; in Bavaria at the High School at Aschaffenburg and the University of Munich; in Saxony at the School of Forestry at Tharandt; in Wurtemberg at the University of Tubingen; in Baden at the Technical High School, Carlsruhe; in Hesse at the University of Giessen; and in the Thuringian States the College at Eisenach, besides which lectures on forestry are given at the Agricultural High Schools in Berlin, Bonn, and Halle. At the nine institutions named there are thirty-two lecturers on forestry, eighty-three other lecturers for the education of forest-keepers, and numerous assistants. All the institutions are furnished with abundant means of teaching, with libraries, collections, botanical and experimental gardens, and sometimes special teaching districts are assigned to them. The total number of students of forestry amounted within the last few years to between 400 and 450, of whom about 250 were candidates for the State Forest Service. For the Lower Forest Service also, different schools exist in the various states for theoretical instruction.

The trial of new methods and the improvement of the existing ones is the work of the German Board of Experimental Forestry which is controlled by the Union of German Experimental Forestry Institutions at Eberswalde. To it belong nine experimental institutions in Prussia, Bavaria, Saxony, Wurtemberg, Baden, Hesse, Brunswick, Thuringia, and Alsace-Lorraine. The united interests of German forestry are represented by the "German Forest Union," and by the German Forest Council. At present about 2,000 members belong to the Union.

Forestry at the Royal Show.

At the forthcoming Exhibition of the Royal Agricultural Society of England, a portion of the Educational Building will be devoted to the subject of forestry. The exhibits will consist of plants and timber, diseases, insects, tools, appliances, and products, while open-air demonstrations on the nursery treatment of seedlings will be given on certain days.

Prosecutions under the Food and Drugs Acts and Diseases of Animals Acts.

Statistics relating to various non-indictable offences tried in Courts of Summary Jurisdiction in England and Wales are given in the judicial statistics for 1902, and among these offences it may be noted that proceedings were taken against 4,030 persons in connection with the adulteration of foods and drugs, and in 3,166 cases a fine was imposed. The number of prosecutions is the highest for the past twenty years. In the five years 1888–1892 the average number of prosecutions was 2,114, whilst in the five years 1898–1902 the number recorded was 3,585, showing a very material increase. The only counties in which no prosecutions occurred were Rutland and Radnor. In London the prosecutions numbered 1,416, Lancashire taking the second place with 417, and Yorkshire the third place with 321 prosecutions; Stafford, Warwick, Essex, Southampton, Kent and Glamorgan had over 100 each. In eleven counties the figures were under ten.

In the case of the Diseases of Animals Acts the prosecutions numbered 2,042, as compared with 1,617 in 1901, 1,508 in 1900, and 3,625 in 1899. Of these prosecutions 1,641 led to convictions and the imposition of a fine. The average for the five years 1898–1902 shows an increase over the five previous years of about 1,000. The prosecutions for offences relating to dogs number 9,088, or some 2,000 in excess of the figures for 1901; but the five years' average is 1,000 less than for the previous five years. Of the 9,088 persons prosecuted, 8,283 were convicted and fined. The highest number of prosecutions under this division occurred in 1898, when the high figure of 43,210 was reached. The average for the past five years is 19,007.

Judicial Statistics.—England and Wales, 1902. *Part* 1.—*Criminal Statistics.* [*Cd.* 2010.] Price 2s. 4d.

Committee on Railway Rates.

The Departmental Committee appointed by the Board of Agriculture and Fisheries to inquire as to the rates charged by railway companies in Great Britain in respect of the carriage of foreign and Colonial, farm, dairy, and market garden produce, have issued a circular letter to Chambers of Agri-

culture and agricultural clubs and societies, inviting them to nominate a member who would be prepared to give evidence to show that preferential treatment, as regards rates or in any other respect, is apparently given by the railway companies in Great Britain for the conveyance of foreign and Colonial, farm, dairy, and market garden produce from foreign ports or home ports to the principal urban centres as compared with the treatment of similar home produce conveyed from home ports and intervening and other inland stations to the same centres.

In order that the Committee may be in a position to make arrangements to hear evidence according to the localities affected and to avoid unnecessary repetition of evidence, the Committee desire that in the first place particulars of proposed evidence should be tabulated and submitted on a form which has been prepared specifying in detail the particular instances which it is desired to bring under the notice of the Committee

The Committee hope to receive the assistance of all parties interested, in order to make the inquiry as complete and effective as possible, and they wish it to be widely known that evidence will be accepted not only from Chambers of Agriculture and other associations but from all parties who consider that they have grounds for complaint. Communications on the subject should be addressed to Mr. E. C. Stoneham, 7, Whitehall Gardens, London, S.W.

Recent Publications of the Board.

In view of the exceptionally wet character of the weather during the year 1903, and of the apprehension expressed in several quarters that the fluke parasite, which causes liver-rot, might increase to such an extent as to be a serious menace to the sheep stock of the country, the Board of Agriculture and Fisheries thought it desirable to issue detailed information concerning possible preventive and remedial measures against this disease. In consequence of the severe outbreak of rot which occurred in 1880–2, the Royal Agricultural Society of England undertook a special inquiry into the subject, the results of which may still be held to form

the standard work upon the disease in question. With the view of giving wider publicity to the knowledge then obtained, the Board addressed a letter to the Royal Agricultural Society requesting their permission to reprint three articles published in that Society's Journal which contain much useful information regarding the disease. This permission the Royal Agricultural Society, with the greatest courtesy, at once granted; and the articles in question have now been issued in the belief that their republication will prove of use to British farmers.

Among the leaflets recently issued are the Black Rot of Potatoes (No. 105); and Fertilisers for Market Garden Crops (No. 106). Copies of these leaflets may be obtained free of charge on application to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, S.W.

A list has also been issued containing the names and addresses of the honorary agricultural correspondents appointed by the Board, with a copy of their instructions. [Cd. 2049. Price 2½d.

Collection of Parcels in Rural Districts.

With a view of making the parcel post more convenient for the despatch of parcels from rural districts, the Postmaster-General has sanctioned the following arrangements in the case of parcels handed to postmen or to mail cart drivers on the road :—A rural postman, whether on foot or mounted on a bicycle or tricycle, will accept parcels tendered to him for the post, provided that he is not already fully loaded, and that the weight of the parcels handed to him by any one person does not exceed 11 lb. in the aggregate. Parcels of a greater aggregate weight than 11 lb. will be collected if notice is given to the postman on the previous day. A rural postman who uses a horse and cart will accept any number of parcels handed to him, provided he can conveniently carry them in his cart. The driver of a mail cart is required to accept unregistered inland parcels properly prepaid which are tendered to him for the post when he is engaged in clearing a country letter box, but not at any other point of his journey. He is not required to weigh parcels or to check the postage, and the parcels are not

considered to be finally accepted until they have reached a post-office. Senders should accordingly take care that parcels handed to a mail cart driver do not exceed the limit of weight (11 lb.), and that they bear the correct amount of postage.

In cases where a sufficient number of parcels are regularly despatched, arrangements will be made, if desired, for their collection from the sender's premises, either every week-day or on certain specified days each week.

The United States Department of Agriculture.

The Budget of the United States Department of Agriculture for the year ending June 30th, 1905, which has received the sanction of the Senate, amounts to £1,265,000. In the Report of the Senate Committee on the Bill it is mentioned that fears have been expressed that the appropriations for the Department are increasing faster than the public good demands, but that in proportion to the area of agricultural land and the number of people engaged, the United States is spending less in aid of agriculture than many other Governments. There is, however, reason for more liberal expenditure than in European countries, where many years of experience have settled the crops and methods suited to their conditions, whereas in the United States new crops are constantly being introduced and new areas brought under cultivation.

The rapid development which has taken place in this Department during the past ten years is shown by the fact that whereas the total outlay in 1895-6 was £659,000, in 1904-5 the sum provided is nearly double that figure. The cost of the principal sections of the Department was fixed as follows :—

	Sum granted in 1904–5. £
Weather Bureau	278,800
Bureau of Animal Industry*	289,100
,, ,, Plant Industry	158,400
,, ,, Forestry	93,750
,, ,, Chemistry	36,250
,, ,, Soils	51,650
,, ,, Entomology	18,250
,, ,, Biological Survey	11,000
,, ,, Publications	50,100
,, ,, Statistics	41,100
Agricultural Experiment Stations...	169,800

* A brief description of the work of the Bureau of Animal Industry is given on page 163.

The work of the various bureaus is of a very comprehensive character, and the charges enumerated above are largely incurred in carrying out original investigations in matters affecting agriculture and its allied industries in the United States.

Importation of Plants, &c., into Tunis and into the Transvaal.

The Tunisian Government have issued a Decree, dated December 24th, 1903, regulating the importation of plants, with a view to preventing the introduction of phylloxera into Tunis. The importation of all portions or products of the vine, as well as vegetable manure, soil, &c., is prohibited; living trees, shrubs, and vegetation (other than vines) must be accompanied by a declaration to the effect that certain conditions have been fulfilled, and they can only be imported from October 15th to May 15th in each year. Certain varieties of fresh vegetables are prohibited, but potatoes are admitted when cleaned and freed from earth; or if from a country free from phylloxera when accompanied by a certificate to that effect.

An Ordinance, dated February 10th, 1904, has been passed by the Legislative Council of the Transvaal, giving power to the Lieutenant-Governor to make regulations for the prevention of disease among plants in that Colony.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of May, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	ENGLAND. First Quality.	ENGLAND. Second Quality.	SCOTLAND. First Quality.	SCOTLAND. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 8	7 5	36 0	33 8
Herefords	7 9	7 3	—	—
Shorthorns	7 8	7 2	35 3	33 0
Devons	7 10	7 4	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8½	7¾	8½	6½
Sheep :—				
Downs	8¾	8	10	—
Longwools	8	7¼	9¼	7¼
Cheviots	9¼	8¾	10	9¼
Blackfaced	8½	7¾	9¾	8½
Cross-breds	8½	8	10¼	9¼
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	5 6	5 2	5 9	5 1
Porkers	6 1	5 9	6 1	5 6
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows —	£ s.	£ s.	£ s.	£ s.
In Milk	19 18	17 2	19 19	15 17
Calvers	19 1	16 7	19 10	15 12
Calves for Rearing	2 7	1 16	2 5	1 12
Store Cattle :—				
Shorthorns—Yearlings ...	9 6	7 18	9 4	7 19
,, Two-year-olds	13 10	11 13	14 13	12 1
,, Three-year-olds	16 9	14 14	15 16	14 4
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools—Hoggs, Hoggets, Tegs and Lambs	47 6	42 0	—	—
Scotch Half-breds ,, ...	40 6	33 9	39 9	32 9
Store Pigs :—				
Under 3 months	18 3	15 0	23 0	17 3
Over 3 months	33 3	27 6	31 6	27 0

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of May, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	53 8	52 2	53 8	52 6	53 8*	51 4*
	2nd	50 2	47 10	47 10	45 6	—	46 8*
Cow and Bull ...	1st	—	44 7	45 6	45 6	43 2	44 4
	2nd	—	39 4	40 10	39 8	32 8	38 6
U.S.A. and Canadian :—							
Birkenhead killed	1st	49 0	50 9	49 0	50 2	50 2	44 4
	2nd	46 8	46 4	44 4	45 6	—	39 8
Argentine Frozen Hind Quarters ...	1st	29 2	31 9	31 6	30 4	29 2	29 2
American Chilled Hind Quarters ...	1st	56 0	53 8	53 8	54 10	53 8	56 0
VEAL :—							
British	1st	66 6	67 11	67 8	78 2	67 8	72 4
	2nd	60 8	52 2	57 2	68 10	—	—
MUTTON :—							
Scotch	1st	80 6	—	80 6	81 8	80 6	80 6
	2nd	75 10	—	74 8	72 4	71 2	66 6
English	1st	71 2	68 3	75 10	74 8	—	—
	2nd	61 10	56 7	70 0	65 4	—	—
Argentine Frozen ...	1st	37 4	36 2	35 0	35 0	35 0	35 0
LAMB :—							
British	1st	95 8	89 10	96 10	103 10	109 8	100 4
	2nd	81 8	78 2	93 4	94 6	96 10	79 4
New Zealand ...	1st	51 4	52 6	52 6	52 6	54 10	54 10
	2nd	46 8	49 0	—	49 0	51 4	52 6
Australian	1st	45 6	48 5	47 10	46 8	44 4	—
	2nd	44 4	46 8	—	42 0	—	—
PORK :—							
British	1st	53 8	58 4	53 8	50 2	49 0	44 4
	2nd	47 10	46 1	—	42 0	43 2	37 4

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each of the under-mentioned Weeks in 1904, and in the corresponding Weeks in 1903 and 1902.

Weeks ended (*in* 1904).	Wheat.			Barley.			Oats.		
	1902.	1903.	1904.	1902.	1903.	1904.	1902.	1903.	1904.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 2 ...	27 7	25 0	26 3	26 7	23 11	22 1	19 10	16 10	15 5
,, 9 ...	27 8	24 11	26 6	26 7	24 1	22 6	20 0	17 0	15 7
,, 16 ...	27 8	24 11	26 11	26 11	24 1	22 3	20 0	16 10	15 9
,, 23 ...	27 7	25 0	27 3	26 7	24 1	22 4	20 3	16 11	15 11
,, 30 ...	27 4	25 4	26 11	26 7	24 3	22 3	20 2	17 0	15 8
Feb. 6 ...	27 2	25 6	26 9	26 9	23 9	22 4	20 3	16 11	15 11
,, 13 ...	26 11	25 6	26 8	27 5	23 7	22 2	20 3	17 1	15 9
,, 20 ...	27 1	25 4	26 11	26 11	23 4	22 7	20 4	17 1	16 0
,, 27 ...	27 1	25 3	27 10	26 8	23 2	22 4	20 5	17 1	16 3
Mar. 5 ...	27 0	25 3	28 8	26 8	23 1	22 6	20 5	17 1	16 5
,, 12 ...	27 1	25 1	29 1	26 6	22 10	22 5	20 6	17 0	16 8
,, 19 ...	27 1	25 1	28 6	26 4	22 9	22 9	20 6	16 10	16 7
,, 26 ...	27 2	25 2	28 2	27 2	22 4	22 8	20 7	17 0	16 7
Apl. 2 ...	27 3	25 3	27 11	26 5	22 6	22 10	20 6	17 0	16 6
,, 9 ...	27 5	25 4	27 10	26 7	21 10	22 5	21 0	17 2	16 5
,, 16 ...	27 7	25 6	27 9	27 1	21 6	22 6	21 1	17 3	16 4
,, 23 ...	28 9	26 1	27 9	26 5	21 9	22 0	21 6	17 9	16 4
,, 30 ...	29 9	26 10	27 8	27 5	22 1	21 1	21 10	18 0	16 3
May 7 ...	30 9	27 6	27 4	26 10	21 10	20 8	22 6	18 2	16 7
,, 14 ...	31 1	27 9	27 1	25 3	22 5	19 10	22 5	18 4	16 6
,, 21 ...	31 6	27 10	26 9	25 4	23 7	20 4	22 6	18 5	16 7
,, 28 ...	31 6	27 8	26 9	25 1	23 7	19 8	22 10	18 5	16 7
June 4 ...	31 3	27 6	26 10	24 3	23 10	18 8	22 11	18 4	16 8
,, 11 ...	30 11	27 8	26 6	23 8	21 5	18 5	22 8	18 7	16 10
,, 18 ...	30 6	27 6		23 5	20 7		23 0	18 3	
,, 25 ...	30 5	27 6		24 3	22 0		22 9	18 6	
July 2 ...	30 8	27 9		25 5	20 7		22 5	18 6	
,, 9 ...	30 10	28 1		24 8	19 11		22 10	18 3	
,, 16 ...	30 11	28 3		23 8	20 5		22 10	18 7	
,, 23 ...	31 5	28 7		25 0	20 10		22 8	18 5	
,, 30 ...	31 8	28 11		25 0	21 0		22 10	18 6	
Aug. 6 ...	31 7	29 3		24 11	20 1		22 11	18 8	
,, 13 ...	31 7	29 11		24 9	21 3		22 2	18 10	
,, 20 ...	31 5	29 9		22 10	20 4		21 11	18 6	
,, 27 ...	31 7	30 0		26 2	22 3		21 0	18 7	
Sept. 3 ...	29 9	30 3		24 6	22 5		19 10	18 5	
,, 10 ...	27 10	28 6		27 5	22 4		19 2	17 0	
,, 17 ...	27 1	27 5		26 4	24 2		18 4	16 4	
,, 24 ...	26 6	27 0		26 4	24 0		18 0	16 2	
Oct. 1 ...	25 10	26 3		25 11	23 9		17 5	15 9	
,, 8 ...	25 5	25 10		26 2	23 8		17 2	15 6	
,, 15 ...	25 1	25 8		26 1	23 9		17 0	15 5	
,, 22 ...	24 11	25 10		26 4	23 7		17 0	15 8	
,, 29 ...	25 0	26 0		26 7	24 2		17 3	15 8	
Nov. 5 ...	25 1	26 4		26 3	24 3		17 2	15 9	
,, 12 ...	25 0	26 6		25 11	24 6		17 3	15 9	
,, 19 ...	24 11	26 9		25 6	24 3		17 2	15 10	
,, 26 ...	25 0	26 6		24 11	23 11		17 0	15 11	
Dec. 3 ...	25 1	26 8		24 4	23 9		17 0	15 9	
,, 10 ...	25 0	26 7		24 3	23 2		16 10	15 9	
,, 17 ...	24 10	26 9		24 2	23 0		16 10	15 7	
,, 24 ...	24 10	26 5		24 1	22 5		16 8	15 6	
,, 31 ...									

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—		Wheat. 1903.	Wheat. 1904.	Barley. 1903.	Barley. 1904.	Oats. 1903.	Oats. 1904.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	March ...	38 7	37 1	23 8	22 5	19 5	16 10
	April ...	39 11	36 9	23 9	22 2	19 6	16 8
	May ...	41 6	35 11	24 2	21 11	19 6	16 5
Paris:	March ...	39 1	37 4	24 0	21 9	19 1	16 1
	April ...	41 4	37 5	24 2	21 0	18 10	16 5
	May ...	42 8	35 11	24 9	20 9	18 9	16 5
Belgium:	March ...	27 4	30 6	22 5	21 5	17 6	15 5
Berlin:	March ...	33 11	37 11	—	—	20 0	18 1
	April ...	34 6	38 1	—	—	19 7	17 7
Breslau:	March ...	31 4	37 2	23 6	22 3	17 11	16 5
	April ...	31 9	37 6	23 4	22 3	18 1	16 3

AVERAGE PRICES of **British Wheat, Barley** and **Oats** during the Month of May, 1903 and 1904.

—	Wheat. 1903.	Wheat. 1904.	Barley. 1903.	Barley. 1904.	Oats. 1903.	Oats. 1904.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	28 1	26 9	20 6	18 2	18 11	17 3
Norwich	26 6	27 11	21 3	21 6	17 4	15 10
Peterborough ...	26 10	25 3	20 0	18 8	17 9	15 4
Lincoln	27 11	26 0	21 8	18 9	17 9	15 9
Doncaster	27 10	26 2	21 5	21 5	18 0	16 8
Salisbury	28 5	27 2	20 7	20 10	18 3	16 7

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of May, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British	11 0	10 0	—	—	—	—	13 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	91 0	88 6	90 0	87 0	—	—	—	—
Danish ...	95 6	94 0	97 6	94 9	96 9	93 6	94 9	—
Russian ...	81 6	78 0	—	—	85 6	82 6	84 6	81 0
Australian ...	85 0	81 0	86 0	83 6	86 0	84 0	87 9	83 0
New Zealand...	86 3	82 6	88 0	84 9	90 0	88 0	88 6	83 6
CHEESE :—								
British Cheddar	75 0	70 0	—	—	72 0	68 0	62 3	58 0
			120 lb.	120 lb.	120 lb.	120 lb.		
,, Cheshire	—	—	55 9	50 0	57 6	52 6	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	43 6	41 9	43 3	37 9	42 9	40 9	45 0	42 0
BACON :—								
Irish	65 0	51 3	58 3	55 6	65 0	60 0	53 9	50 6
Canadian ...	52 3	45 6	47 3	44 3	46 3	42 3	44 0	41 6
HAMS :—								
Cumberland ...	96 0	82 6	—	—	—	—	—	—
Irish	91 0	81 6	—	—	—	—	90 0	80 0
American ...	49 3	46 3	49 9	45 6	47 3	45 6	47 6	46 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	8 3	7 4	—	—	—	—	—	—
Irish	7 7	6 6	7 0	6 3	6 9	5 11	6 8	6 4
Danish ...	7 10	6 4	7 3	6 8	—	—	7 6	6 7
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Main Crop ...	110 0	96 0	—	—	112 0	97 0	—	—
Up-to-Date ...	101 0	89 0	112 6	111 0	87 0	77 0	94 0	92 6
HAY :—								
Clover... ...	89 6	82 0	85 0	—	81 0	—	99 0	89 6
Meadow ...	81 6	74 6	68 0	—	57 6	45 0	—	—

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	MAY.		5 MONTHS ENDED MAY.	
	1904.	1903.	1904.	1903.
Swine-Fever:—				
Outbreaks	193	187	646	677
Swine Slaughtered as diseased or exposed to infection ...	799	897	3,309	3,244
Anthrax:—				
Outbreaks	112	73	473	368
Animals attacked	261	107	748	552
Glanders (including Farcy):—				
Outbreaks	123	115	634	558
Animals attacked	207	166	1,156	918
Sheep-Scab:—				
Outbreaks	27	32	913	1,046

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	MAY.		5 MONTHS ENDED MAY.	
	1904.	1903.	1904.	1903.
Swine-Fever:—				
Outbreaks	7	16	48	41
Swine Slaughtered as diseased or exposed to infection ...	309	438	1,350	1,275
Anthrax:—				
Outbreaks	—	1	2	1
Animals attacked	—	2	2	2
Glanders (including Farcy):—				
Outbreaks	1	—	4	1
Animals attacked	1	—	19	2
Sheep-Scab:—				
Outbreaks	*20	*32	*339	*364

* These figures refer to April, and to the periods ending April, respectively.

LIST OF LEAFLETS ISSUED BY THE BOARD OF AGRICULTURE AND FISHERIES.

(1.) *Leaflets relating to Acts of Parliament.*

No.	Title.	No.	Title.
8	Farmers and Assessments to Local Rates.	26	Farmers and the Income Tax.
		27	Remission of Tithe Rentcharge.
18	Fertilisers and Feeding Stuffs Regulations, 1897.	39	Assessment to Land Tax.
		66	Workmen's Compensation Act, 1900.

(2.) *Leaflets dealing with Farm Animals, including Poultry.*

13	Acorn Poisoning.	82	Preparation of Wool for Market.
21	Warble Flies.	83	Preservation of Eggs.
28	Anthrax.	89	Fluke, or Liver Rot in Sheep.
29	Swine Fever.	95	Ringworm in Cattle.
57	External Parasites of Poultry.	96	Parturient Apoplexy.
58	Internal Parasites of Poultry.	100	Pig Breeding and Feeding.
61	Sheep Scab.	101	Prevention of White Scour in Calves.
67	Favus in Poultry.	102	Quarter Ill, Quarter Evil, or Black Leg.
78	Liver Disease of Poultry.		
81	A Substitute for Dishorning.		

(3.) *Leaflets dealing with Miscellaneous Subjects.*

6	Voles and their Enemies.	80	Use of Artificial Manures.
9	Ensilage.	85	Haymaking.
32	Foul Brood or Bee Pest.	93	Farmyard Manure.
36	Cultivation of Osiers.	97	Farmers' Co-operative Societies.
63	Destruction of Charlock.	98	Grading and Packing Fruit and Vegetables.
72	Purchase of Artificial Manures.		
73	Cultivation of Maize for Fodder.	99	Relationship of Woods to Domestic Water Supplies.
74	Purchase of Feeding Stuffs.		
79	Rations for Farm Stock.	106	Fertilisers for Market Garden Crops.

(4.) *Leaflets dealing with Wild Birds.*

40	Kestrel or Wind-hover.	50	Water Wagtails or "Dishwashers."
42	Short-Eared Owl.	51	White or Barn Owl.
43	Titmice.	54	Spotted Flycatcher.
44	Lapwing, Green Plover, or Peewit.	55	Swallow.
45	Starling.	84	House Sparrow.

(5.) *Leaflets dealing with Insects and Fungi injurious to Crops.*

1	Black Currant Mite.	47	Asparagus Beetle.
2	Vine, Plum, Hop and Raspberry Weevils.	48	Pea and Bean Thrips, or Black Fly.
		49	Fruit Tree Beetle.
3	"Flea" Beetles.	52	Gooseberry Mildew.
4	Winter Moths.	53	Pear Midge.
5	Mangold Fly.	56	Canker Fungus.
10	Wireworms.	60	Goat Moth & Wood Leopard Moth.
11	Daddy Longlegs or Crane Fly.	62	Pear and Cherry Saw Fly.
12	Gooseberry Saw Fly.	64	White Root Rot.
14	Raspberry Moth.	65	Small Ermine Moths.
15	Apple Blossom Weevil.	68	Currant Aphides.
16	Apple Sucker.	69	Tent Caterpillars.
19	Pea and Bean Weevils.	70	Winter Washing of Fruit Trees.
20	The Magpie Moth.	75	Root-knot Disease in Cucumbers and Tomatoes.
22	Diamond-back Moth.		
23	Potato Disease.	76	Cucumber and Melon Leaf Blotch.
24	Ribbon Footed Corn Fly.	77	Finger-and-Toe in Turnips.
25	Chafer-beetles or White-Grubs.	86	Brown Rot of Fruit.
30	Codling Moth.	87	Fungus Disease of Young Fruit Trees.
31	Onion Fly.	88	Hop Aphis.
33	Surface Caterpillars.	90	Pith Moth.
34	Woolly Aphis or Apple Root Louse.	91	Pine Beetle.
35	Celery Fly.	92	Bunt and Smut.
38	Carrot Fly.	94	Millipedes and Centipedes.
41	Red Spiders.	103	Pine Saw Fly.
46	Stem Eelworm.	105	Black Scab of Potatoes.

The issue of Leaflets 7, 17, 37, 59 *and* 71 *is suspended.*

Copies of these Leaflets may be obtained free of charge and post free on application to the Secretary, Board of Agriculture and Fisheries, 4, *Whitehall Place,*

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THE JOURNAL

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BOARD OF AGRICULTURE.

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DESTRUCTION OF WEEDS BY SURFACE CULTIVATION.*

The system I propose to describe in the following pages is one that has been carried out with great success for several years on a farm of 400 acres (300 arable) in East Anglia, and will, it is believed, supersede the system of spraying so much advocated of late years. Spraying, at the best, is an expensive operation, and up to the present has been effectual in the case of only a very few weeds, principally charlock. By our method all seedlings may be destroyed.

The climatic conditions prevailing in the eastern counties differ, as is generally known, from those of the rest of England in that the rainfall is lighter; cold easterly or north-easterly winds are the chief characteristic of the spring, in which season the greater part of the surface cultivation to be described is carried on. The spring growth is, consequently, somewhat later as a rule than in the western and southern counties.

The farm comprises both light and heavy soils. The lighter portions of it were infested with red weed (poppy), and the heavier with charlock.

The system referred to consists in frequently stirring the surface of the soil, with the following results:—

1. The growth of weeds is prevented.

2. The soil is maintained in a fine condition so as to retain moisture.

* The destruction of weeds is also dealt with in Leaflet No. 112—"Weeds and their Suppression." An article on the subject appeared in the *Journal*, March, 1904.

3. The spread of injurious grubs, wireworm, &c., is checked.
4. The soil is kept entirely at the service of the desired crop.

There is an old saying, "When a crop stands still stir the soil," and our method is an extension of this principle. We stir the ground repeatedly for as long as the crop will allow, and find that the process is a beneficial one to the thriving crops as well as to the most unpromising ones.

The frequent use of horse implements takes the place of hand labour. The only weeding done by hand is spudding docks and removing the thistles left by the horse-hoe in the rows of corn. Of course, where the work, for some reason or other, has been indifferently done, an additional sixpence per acre is well spent in pulling any weeds that may have come into flower at the time of docking and spudding.

To take the principal grain crop, autumn-sown wheat: where possible, allow the ground to lie for three or four weeks between ploughing and drilling. A number of weed seeds will germinate which will be killed by the operation of putting in the wheat crop. A week before the wheat appears above ground, it is chain-harrowed (weather permitting) in order to kill the young weeds which have already germinated, without breaking off the young wheat plant which at this time is perhaps half an inch below the surface, and is so brittle that the lightest tooth or spike would break it off. The young weeds, if left until the wheat was above ground, might be too strong to be destroyed with any of the implements employed, especially if rain delayed operations for a further week or ten days.

Later on, light harrows, the American weeder, the poppy-killer, the spiked chain-harrow, and other like implements may be run over the wheat after it is well up, any time during the late autumn when the condition of the soil allows.

Failing suitable weather, most excellent results have been obtained during the winter by running a medium harrow over the wheat during a slight frost.

This work can be continued and is often necessary during the spring, and is completed by a final horse-hoeing not later than the end of May to destroy thistles and any other weeds that may have escaped the harrow and weeders. The lever horse-hoe is the best for this purpose.

Winter beans are treated in the same way as wheat, and thus all hand-hoeing, which is the expensive operation connected with this crop, is avoided. The horse-hoeing in the case of beans must be repeated two or three times at intervals to a much later date than in the case of wheat. This is more especially to be observed in connection with spring-sown beans. Beans sown in rows 26 in. apart and fairly thick in the rows (two bushels of seed per acre) give very good results by this system.

The same method may be followed with regard to winter oats provided great care is taken and the lighter implements used, as the oats are much less deeply rooted, and are therefore easily torn up. The horse-hoe in this case must not go in so deep, and in a dry season the roller should follow the horse-hoe. Spring oats are similarly treated.

Barley, like wheat, is chain-harrowed just before it appears above the ground, in order to stir the surface and kill the redweed and charlock. After the barley has appeared, that is, after it has lost the brittleness of the first few days, it is gone over once a week if necessary with a light scratch-harrow, or preferably with the American weeder or the poppy-killer, up to the date of sowing the clover seeds. This latter operation should be followed by a horse-hoe, which cuts up and kills where it goes any weeds that have escaped the various harrowings.

By the end of May, the barley is so far advanced that it is well to sow the clover seeds then, though in a late season on a late-sown crop they may be sown as late as the middle of June without damage to the barley.

Should any redweed or charlock appear after the horse-hoeing, it need not be feared, as the barley has by that time got a good start, and the weeds will be smothered to such an extent as to prevent their reaching maturity.

One great advantage of this system is that the yield of grain crops is increased; but, in the case of barley, unless care is exercised to avoid burying any of the young plant, the quality is likely to suffer through irregular ripening of the grain.

Land should be harrowed down two to four weeks before drilling, when time allows, then the harrowing after drilling kills the first growth of weeds.

There is risk in putting small seeds in during May if the

season is dry, but some risk must be taken in order to overcome redweed and charlock on light and heavy soils respectively. The risk of late-sown seeds not germinating is considerably lessened: firstly, through the fine friable surface obtained by this method of cultivation, which helps to keep the land moist; and, secondly, if the small seeds are coulter-drilled into the soil instead of being merely sown broadcast.

Since the use of self-binders has become more general it is usual to sow the small seeds later, with the view of preventing

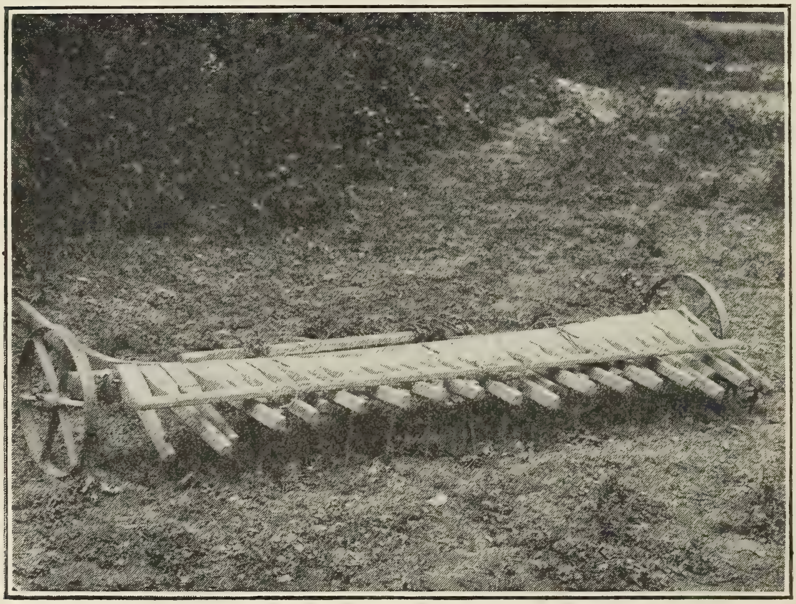


FIG. 1.—THE POPPY KILLER.

too great a growth, which is so troublesome at harvest when tied up in the corn sheaf.

A few words descriptive of the two implements generally used may not be out of place.

The poppy-killer (Fig. 1), or weed extirpator, is a light, easily-drawn implement, 8 ft. wide, running on two wheels of 18 in. diameter. The teeth, thirty-three in number, are of iron, 8 in. long, and fitted into wooden bars. Half of these bars are 17 in. long, and the other half 21 in., so that the outer row of teeth runs 4 in. behind the inner row. The wooden bars are attached

together by means of an iron rod which extends the whole width of the machine.

By this arrangement, it will be seen, the teeth rest independently upon the ground, and the implement accommodates itself to an uneven surface. On lumpy or cloddy ground it also works well, since the two rows of rakes are one in advance of the other, thus allowing clods to pass between. When the ground is very rough it is well to run a roller in front of the poppy-killer ; both machines can be worked by one horse if attached one behind the other. Pressure is put upon the teeth by means of a wooden rail laid across the bars. For transit the bars are turned up and the wooden rail placed on top of them (Fig. 2), and fastened by a hook attached to the axle. A reference to the accompanying illustrations will make the above description clearer.

The second implement is the American weeder. This machine is really a very light drag-rake without wheels, the teeth being fixed, and much closer together than in the poppy-killer. The width of the weeder is 8 ft., and it is made with either two or three rows of teeth. The handles are adjustable up and down, and the depth of work is under the operator's control.

The advantages of this machine over the poppy-killer lie, firstly, in the fact that the depth of working can be regulated ; and, secondly, in the ease with which any rubbish collected in rows can be left. This has been found very useful where the previous crop has been thousand-headed kale, cabbage, or kohl-rabi, the roots of which are so frequently pulled on to the surface while harrowing the land for barley.

It might be supposed that the extra horsework described above would necessitate a larger number of horses being kept ; this, however, is not the case. On this farm, at any rate, the number of horses and men kept is below the average.

The weeding of the corn is really a very slight addition to the work, as will be seen from the fact that one horse will do from 10 to 12 acres per day, and it is unusual for the operation to require to be repeated more than half a dozen times. One horse will therefore be occupied for six weeks for every 60 or 70 acres of corn grown. We have known the work to be done at a cost of one shilling per acre for the manual labour.

The heavy work is arranged to come in, so far as possible,

during slack time. For example, manuring for roots is done before ploughing the stubbles in the autumn months, instead of, as is usual, in the busy months of April and May. The work of putting in the root crops in the spring is in this way very much simplified and the labour far more equally distributed. The land, manured and ploughed in the autumn, is then merely harrowed, cultivated and drilled in April and May. This is

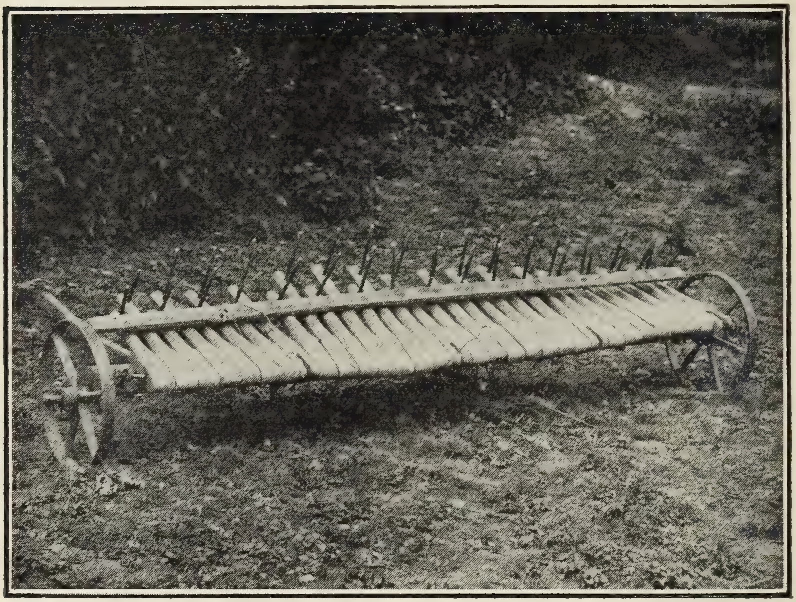


FIG. 2.—THE POPPY KILLER.

done on the flat and not in ridges, which is no detriment where land is clean, and thus horse labour is further reduced.

This drilling on the flat is a great assistance to the hoeing and chopping out of the roots, which is done by means of a horse-hoe worked along and across the rows as many times during the summer as is necessary to keep down all weeds. Thus all that is left for hand labour is the drawing of the hoe round the plants for the purpose of removing any weeds and thinning the bunches.

This constant horse-hoeing is believed to encourage the growth of the roots considerably, and even where there are a few gaps, as is sometimes the case, should the plant be somewhat

irregular the loss is not so great as might be expected, as a catch crop of mustard or late turnips is drilled between the rows of roots in the months of July or August. The turnips grow rapidly after the main root-crop of mangold has been drawn in October. The mustard has been found useful in protecting the mangolds from frost when, as may sometimes happen, it has been found necessary to leave this crop standing well into November.

These catch crops make very useful feed for sheep in the autumn and winter months, and are but very little damaged by the harvesting of the main crop.

In conclusion, I may remark that although the system I have described is, if properly carried out, an effective and relatively cheap method of suppressing annual weeds, it is evident that care must be exercised also in other directions if the best results are to be obtained.

For instance, hedgerows and ditches must be properly cleaned so that weeds may not mature there and so spread over the fields; screenings from the threshing-mill, sweepings from the barn and hay-loft, &c., must not be thrown on to manure heaps or left carelessly about, but must be destroyed—preferably by burning. It is a common error to suppose that weed seeds are easily destroyed by fermentation on manure heaps.

One point may be mentioned here as likely to be of assistance in some cases, and that is, where possible, put the manure made from straw which has been grown upon heavy land on to the light lands, and *vice versa*. The reason is that many weeds which grow upon the one kind of soil will not flourish on the other; some prefer light and others heavy land. This simple plan can often be effectively carried out without trouble or expense. For example, a stack of straw grown upon heavy land might be put in the position which in the following winter will serve as lambing yard, which position is sure to be selected on the lighter portion of the farm.

Again, it would be easy to give sheep, feeding on the heavy portion of the farm, chaff and coulder from the lighter portion, containing only light-land weeds. This principle can, of course, be carried out in the stable, and also in connection with all farm stock without extra work, given a little forethought.

REPORT ON PURITY AND GERMINATION OF SAMPLE OF SEEDS.

Laboratory Number.	Name on Sample.	Composition of the Sample.					Germination of Pure Seed.		Remarks.
		Impurities—Mineral or Vegetable.	Seeds of other Plants per cent.	Parasites—Dodder, Ergot, &c.	Chaff, Empty Husks, per cent.	Pure Seed, per cent.	Days Tested.	Germinated per cent.	
7,132	Home-grown Red Clover	3 per cent.	Geranium, Poppy, Ribgrass, 2; Ryegrass, 42—44 per cent.	—	—	53	5	12	Scarcely half the seed in these clovers are true.
7,133	Home-grown Suckling	15 per cent.	Geranium, 10 per cent. Chickweed, 15 per cent. Field Madder, 3 per cent. Ribgrass, 3 per cent. Wild Lettuce, 1 per cent. White Campion, 2 per cent.	—	6	45	—	Nil	
7,134	Trefoil	1 per cent.	—	—	—	99	5	89	
7,135	English Red Clover	3 per cent.	Ribgrass, Field Madder, Campion, Ryegrass, 6 per cent.	—	—	91	5	57	
7,136	Great Sainfoin ...	½ per cent.	Oat, Barley, Tares, ½ per cent.	—	—	99	6	64	
7,[illegible]	Cabbage	1 per cent.	Wheat, Bedstraw, Geranium, 1 per cent.	—	1	97	6	76	
7.[illegible]	Italian Ryegrass	—	—	—	5	95	12	60	
7,1[illegible]	Cocksfoot ...	—	Cats-ear, Yorkshire Fog, and Tares 2 per cent.	Ergot in the Seeds of Yorkshire Fog.	6	92	15	76	I would not recommend the use of the Cocksfoot & Timothy because of the Ergot.
7,140	Timothy	—	Bent, Great Plantain, and Penny Cress, 2 per cent.	Ergot on Timothy.	—	98	8	93	
7,141	Pacey Ryegrass ...	—	Yorkshire Fog, Suckling Clover, Brome, Ratstail, Fescue, and Buttercup, 5 per cent.	—	2	93	14	80	

But above all the farmer must use care and circumspection with regard to the selection of his seeds. Many farmers who will fight an endless battle with the weeds on their land will themselves introduce fresh detachments of the enemy through not being sufficiently particular as to the seeds they buy, accepting probably an inferior sample on account of its costing slightly less; or (and this applies with tenfold force after such a season as last) neglecting to obtain a scientific opinion upon the seeds before using them.

An example of the risk run in this way was brought under my notice this spring. It was the intention to use two samples of home-grown seeds, and, in addition, the required amounts of eight varieties of clover, grass, and cabbage seeds were ordered in the usual way. On the seeds being delivered a sample was taken from each of the ten varieties and forwarded to the Botanist to the Royal Agricultural Society. I append his statement of the result of his examination. Needless to say the inferior seeds were returned and better samples obtained.

W. HARDIE, Ph.D., M.R.A.C.

Coral-Spot Disease. (*Nectria Cinnabarina.*)

One of the most common and most generally distributed of British fungi is that to which the name of coral-spot disease has been given. The first stage of the disease takes the form of bright coral-red warts, which are about the size of millet seed, and are thickly scattered over the surface of dead or dying branches of the tree attacked. These red warts are very conspicuous, and at one time this condition of the fungus was considered to be an independent plant, and called *Tubercularia vulgaris.* At this stage numerous and exceedingly minute spores are produced, and readily scattered by the wind or by insects.

At a later stage the coral-red changes to a rusty-brown colour. The surface becomes rough with projecting points, and a second form of fruit is produced. In many instances the fungus passes through all its stages on dead branches, and when this is the case no direct injury will be done but rather a certain amount of good, consequent upon the hastened decay of the wood upon which the fungus is growing. The indirect danger arising from its presence on dead wood is the possibility of infection of living plants by the spores produced. The earliest indication of disease caused by *Nectria cinnabarina* is the drooping and yellowing of the leaves, which soon die and fall to the ground. A few weeks later the bark becomes slightly shrivelled, and the characteristic coral-red warts begin to appear on the surface. Death of the leaves, and finally of the branch, is due to the choking of the wood vessels by the mycelium, which cuts off the supply of water and food.

The fungus is remarkable for the great number of different kinds of woody plants upon which it can grow and produce perfect fruit, being met with on all fruit and forest trees, excepting conifers, and also on various shrubs. Amongst plants specially susceptible to the attacks of *Nectria* may be mentioned sycamore, elm, hazel, apple, pear, and red and black currants.

Whenever diseased branches are observed they should be removed and burned without delay, as after infection recovery is impossible, and any delay in removal permits the formation of spores and probable infection of neighbouring plants.

Fallen branches, stored pea-rods, poles, &c., are often literally

CORAL-SPOT DISEASE

1. PORTION OF DISEASED APPLE BRANCH. NAT. SIZE.
2. SYCAMORE BRANCH DISEASED. NAT. SIZE.
3. DISEASED BRANCH OF RED CURRANT. NAT. SIZE.
4. CORAL-RED WARTS ENLARGED. ALSO LATER RUSTY-BROWN STAGE.

covered with the bright coral-pink warts of the *Nectria*, and should then at once be destroyed, or at all events removed from the neighbourhood of living trees.

When pruning, it is a wise precaution to protect every cut or damaged surface with a coating of gas-tar, and also to remove and trim the ends of branches broken by the wind or by other agency.

The coloured plate shows the fungus (natural size) on: (1), Portion of diseased apple branch; (2) Sycamore branch diseased; and (3) Diseased branch of red currant. Figure 4 shows coral-red warts enlarged, and in their later stage changed to a rusty brown colour with a roughened surface.

A System of Cropping and Manuring in the United States.

The importance attached by farmers in Denmark to the preservation of the manure produced on the farm was referred to in the previous number of this *Journal*,* and it was mentioned that by the methods adopted the purchase of artificial manures was reduced to a minimum. The Year Book of the United States Department of Agriculture for 1903 contains an account of a small farm of 15 acres situated in Pennsylvania, where the utilisation of the manure appears to have been carried a step further, and, in conjunction with a system of catch-cropping, to have enabled the owner, while growing heavy crops, entirely to dispense with purchased manures. The area actually in cultivation was 13 acres, 2 acres being occupied by buildings, and 30 head of stock were kept, including 17 cows in milk, 11 young cattle, and 2 horses. The cows are all registered Jerseys, and the only products sold were milk and a few young cattle. Male calves were reared if fit for breeding, otherwise they were killed at birth. The yield of milk averaged 480 gallons per cow annually, the quality being high. All the stock remained in the barn all the year round, as none of the land was employed for pasture. The food consisted of silage in winter, or of rye, timothy and clover

* "Farms in Denmark." Vol. XI. No. 3.

maize, peas, and oats in summer, with some hay or dry fodder and concentrated foods such as bran, oil meal, and gluten. The expenditure on feeding stuffs was about £125 per annum. The soiling crops used were: Green rye, beginning about May 1st and continuing about four weeks or until the rye was ready to be cut for hay. Then timothy and clover were fed till peas and oats were ready. When the latter were cut for hay, the silo was opened (about July 4th), and silage was fed till early maize was ready. Maize feeding was continued till the main crop of maize was ready for cutting, and from that time forward silage was fed daily till green rye was available in the spring. No abrupt change was ever made in the system of feeding. The cows were also given 4 oz. of salt daily mixed with their food. All hay and green crops were cut into quarter-inch lengths before being used either for food or bedding. Two silos had been erected on the farm, each 10 ft. in diameter and 34 ft. high, holding together about 100 tons of maize silage.

Every green crop grown was utilised for soiling purposes, the surplus being converted into hay or silage, but as every foot of land is said to receive an abundance of manure, there was no systematic rotation of crops. At least two crops a year were harvested from most of the fields.

The method of dealing with the manure was as follows:—Behind each row of animals in the cattle-shed a gutter 18 in. wide and 7 in. deep was placed. These gutters had no outlet, but they were thoroughly cleaned daily and sprinkled with dry ashes, whilst during the day a quantity of absorbent material, such as leaf mould or dry turf, was placed in them. Each gutter slopes slightly towards a door at one end, and the manure is lifted into a cart, backed up against it. The cart goes immediately to the field, and the manure is spread at once. In summer it is spread on the land from which the soiling crops are removed. In winter it is spread on the rye and grass fields—on the latter particularly when the ground is too soft to place it upon the rye fields. No manure is used on newly-seeded grass lands, but the second and third year grass fields are top-dressed in winter.

The most important feature of this farm, it is observed, is the manner of dealing with the manure. The fact that the stock are

all stabled during the whole of the year makes it possible to save all the manure, both liquid and solid, and the fact that it is applied daily as produced insures that materials washed out by rain are carried into the soil where they are wanted. How much plant food is lost from fermentation after the manure is spread on the fields is not known, but the remarkable yields of every portion of this farm would seem to indicate that this method of dealing with the manure is highly satisfactory under the special circumstances.

Manurial Experiments in Canada.

At the Canadian Experimental Farms some manurial experiments have been carried out for a period of fourteen or fifteen years with a view to testing the application of the principal fertilisers on the more important grain crops. In connection with the preceding article it is interesting to notice that these trials appear to show that farmyard manure can be most economically used in a fresh or unrotted condition. Fresh manure was found to be equal ton for ton in crop-producing power to rotted manure, which, as other experiments are stated to have shown, loses during the process of rotting about 60 per cent. of its weight. In the case of wheat and barley there was practically no difference in yields obtained from plots treated with dung either fresh or rotted, while the oat yield from the plot which received fresh dung was several bushels larger.

After constant cropping for ten or eleven years it was found that the soil on those plots to which no farmyard manure had been applied was much depleted of humus, and hence its power of holding moisture had been lessened and the conditions for plant growth, apart from the question of plant food, had on this account become less favourable. In the spring of 1899, 10 lb. of red clover seed per acre was sown with the grain on all the plots of wheat, barley and oats. The clover seed germinated well, and after the grain was cut the young clover plants made rapid growth, and by the middle of October there was a thick mat of foliage which was then ploughed under. In 1900 the fertilisers on all the plots were discontinued, and

since then the same crops have been grown on all the plots from year to year without fertilisers, sowing clover with the grain each season. The ploughing under of clover was found most effective as an additional source of fertility, and notwithstanding the discontinuance of the use of manures the crops have in many instances been considerably increased. Even in the case of the two plots which had received farmyard manure up to the year 1898, no appreciable falling off in the yield seems to have taken place. In fact, in the case of barley the yield in 1903 was 41½ and 37 bushels respectively on the two plots, compared with an average for the preceding fourteen years of 35 bushels per acre in both cases, although the yield of straw was somewhat less.

The influence of the clover was very marked on the unmanured plots. Where wheat had been grown for eleven years without any manure the crop averaged 10¼ bushels; the yield during the five years during which clover was ploughed in showed an average increase of 4⅓ bushels per acre, or over 40 per cent. In the case of barley, unmanured for ten years, the crop averaged 13⅗ bushels, but the tenth year the crop was reduced to 8 bushels per acre. Subsequent to the use of clover the crops yielded 10⅖, 9⅓, 10⅙, 27⅖ and 23⅘ bushels per acre, an average increase of 20 per cent. The average crop of oats on unmanured land was 30½ bushels per acre; with the use of clover they have stood for five years at 29, 47⅕, 48⅓, 46 and 37⅕ bushels per acre, giving an average increase of 10⅔ bushels, or over 31 per cent.

Testing Varieties of Wheat in Canada.

Experiments for the purpose of testing varieties of wheat and other cereals suitable to the soil and climate of Canada have been carried on at the Dominion Experimental Farms, and in view of the importance of the work the Canadian Minister of Agriculture has recently authorised the formation of a Division of Cereal Breeding.

Dr. Saunders, the Director of the experimental farms, in his Report for 1903, gives an account of the progress of this work,

and of the success which has attended the breeding of new varieties of wheat under his direction. Among the spring wheats commonly grown at the time the farms were established none were so highly or justly esteemed as the Red Fife, and the position it holds is still a pre-eminent one. It is, however, open to one objection which sometimes proves a very serious drawback to its cultivation. It is rather late in ripening, and there have been seasons when early frosts in the North-West have injured the grain so as to reduce its value very materially. With a view to introducing a species of wheat which might be free from this defect, varieties of wheat have been brought to Canada from different countries and grown for many years at all the experimental farms, alongside of the Red Fife and other well known sorts, and their periods of ripening and weight of crop carefully recorded, without, however, a single variety being found having the high quality of the Red Fife and at the same time ripening earlier.

In 1888 the first experiments in the cross-breeding of wheat were begun at the experimental farms, and since that time several hundred new sorts have been produced and tested. In originating many of these new productions the Red Fife has been chosen as one of the parents, and a cross between this and a wheat from Northern Russia has given rise to the varieties known as Preston and Stanley. Taking the average yield obtained on all the farms for a period of nine years, the Preston has given a crop of 34 bushels 41 lb. per acre, while the Red Fife has given 33 bushels 7 lb., a difference in favour of the Preston of 1 bushel 34 lb. per acre. The Preston has also ripened from four to six days earlier.

The Stanley is a twin wheat with the Preston, both having had origin in one kernel. The plant grown from the cross-bred kernel the first season produced heads which were uniformly bearded ; but when the seed from this was sown the year following, some plants produced bearded heads and others beardless. Subsequently, these two varieties were bred to type by discarding all the variations produced, until the type became fixed. Stanley, during a nine years' test, has given an average crop of 32 bushels 2 lb. an acre, which is 1 bushel 5 lb. less than the Red Fife ; in earliness of ripening, however, it is

about the same as the Preston. Two other varieties, known as Huron and Percy, have been produced, which have ripened from four to five days earlier than the Red Fife.

Another variety, known as the Early Riga, was obtained by crossing an East Indian wheat named Gehun, brought from a high elevation in the Himalayas, with a Russian wheat brought from near Archangel, one of the most northerly wheat-growing districts in Russia. The Early Riga has proved to be one of the earliest ripening wheats known, and during the five years it has been under trial it has ripened, on an average, from eight to nine days earlier than Red Fife.

These cross-bred wheats have been submitted to various milling experts with satisfactory results, and they appear to compare favourably with Red Fife both as to quality and yield. Apart from the likelikood of escaping injury by early frost, it is pointed out that the difficulties connected with cutting a large acreage of wheat which all ripens together can be overcome by sowing part of the land with an earlier ripening sort.

These experiments have now been placed under the charge of an officer known as the Experimentalist, and during the past season 503 plots were cultivated for testing the qualities of some 430 varieties of plants, including, in addition to wheat, oats, barley, other cereals, and roots.

Introduction of Macaroni Wheat into the United States.

The cultivation of macaroni wheat, known botanically as *Triticum durum*, to distinguish it from ordinary bread wheat, or *Triticum vulgare*, has recently been introduced into the United States by the Department of Agriculture. Samples of the best varieties were obtained from the Russian provinces north of the Sea of Azov, the home of the best macaroni wheats, where the climatic conditions bear a striking resemblance to those

of the great plains of America. These wheats the Department of Agriculture distributed to growers in suitable localities, and the production of macaroni wheat has since increased with remarkable rapidity, the estimated crop of the two Dakotas alone in 1903 being $10\frac{1}{2}$ million bushels. This description of wheat thrives in abundant sunshine, resists smut and rust, and is a strong grower, yielding largely in excess of the ordinary bread wheats, which often produce indifferent crops in the semi-arid regions of the North. It is used primarily in the manufacture of macaroni, vermicelli, and other edible pastes, and also for blending with low-grade flour.

Indian Wheat Crop.

The final general memorandum on the wheat crop of India for the season 1903–4 shows that the area harvested was 27,773,000 acres compared with 23,092,000 acres in 1902–3, the estimated yield being 9,387,500 tons against 7,766,100 tons last year. This season, it is stated, has been exceptionally favourable for wheat, and the good crop of last year has been exceeded by 20 per cent. in area, and 21 per cent. in yield; yet, with an addition of more than $4\frac{1}{2}$ million acres, the harvested area is still below the level of the early nineties, that is, before 1895–6, when began the series of bad seasons that so sorely afflicted the central and western regions of India. But in the principal wheat-growing tracts of Northern India, where the crop is most prolific, and from which the supplies for export are so largely drawn, the area is the largest on record, the excess over the highest other year being 975,000 acres in the United Provinces, and 360,000 acres in the Panjab, where cultivation has extended on the Chenab and Jhelum Canals. In the United Provinces the season was not quite so good, and in Bengal about the same as last year; but in the Punjab and in the North-West Frontier the copious rain in March was highly beneficial, and an exceptionally good harvest resulted.

Crops in the United States.

Returns made to the United States Department of Agriculture showed that the area of winter wheat in cultivation on May 1st was about 27,083,500 acres. This was 4,932,700 acres less than the area sown in the autumn, and 5,427,000 acres less than the area of winter wheat harvested last year. The average condition on June 1st was 77·7 compared with 82·2 on the same date of 1903. The area of spring wheat sown was about 17,141,000 acres, or 116,000 acres less than last year. Its average condition on June 1st was 93·4. The total reported area in oats was about 27,646,000 acres, having an average condition on June 1st of 89·2; this only differs very slightly from the area sown last year.

Crops in France.

The French Ministry of Agriculture has issued the preliminary estimate of the area under the principal crops in 1904. In the case of wheat the area is slightly greater than that of last year; and the condition of the crop on the 15th of May, 1904, was described as good on about one-half of the area, and on the remainder as fairly good.

Crop.	Area. 1904.	Area. 1903.
	Acres.	Acres.
Wheat	16,240,000	16,144,800
Mixed Corn	394,000	417,800
Rye	3,199,600	3,311,300
Barley	1 738,200	1,871,100
Oats	9,572,500	9,716,300
Green Fodder	1,572,200	1,600,800
Rotation Grass	7,124,100	7,036,700
Permanent Pasture	12,834,100	12,940,400
Potatoes	3,522,100	3,604,800

The Midland Dairy Institute carried out some experiments* in 1903 with a view of ascertaining whether barley can be successfully grown on land in a reduced condition, after a white or other crop, by means of artificial manures. In the plan of the trials there were ten plots, two untreated and eight treated with dressings of nitrogen, phosphate, and potash. Each treated plot was given a dressing of all three, and the effect of each was tested by increasing them in definite proportions. Single acres of selected land in fairly large fields were chosen for the trial grounds, so that each plot was one-tenth of an acre, and the same experiment was carried out on seven farms. In two cases, however, the results were not considered satisfactory, and the particulars given below represent the average results obtained from the five farms which were situated in Lindsey, Lincolnshire. The soil on two of the farms is described as light, on two medium, and on the remaining one as heavy. The previous crops were in three cases barley, in one case swedes carted off, and in one wheat. The barley produced was valued at market prices according to quality, varying in the case of good grain from 26s. 6d. to 30s. per quarter of 442 lb. Light barley was priced at 70s. per ton and the straw and chaff at 15s. per ton in every case. The cost price of the manures were charged, but nothing was allowed for their after effects. The results are summarised in the following table :—

Manurial Experiments with Barley.

No. of Plot.	Manure.			Total Yield of Grain.	Increase Compared with Unmanured Plots 1 and 10.	Profit or Loss.
	Nitrate of Soda.	Super-phos-phate.	Kainit.			
	cwt.	cwt.	cwt.	cwt. lb.	cwt. lb.	£ s. d.
1	—	—	—	18 28	—	—
2	2	2	2	25 44	7 22	1 8 9
3	1	4	2	22 60	4 38	0 7 0
4	1	2	4	23 28	5 6	0 13 6
5	2	4	2	24 98	6 76	0 13 4
6	2	2	4	26 16	7 106	1 5 0
7	1	4	4	21 78	3 56	0 3 3†
8	2	4	4	26 92	8 70	1 4 7
9	1	2	2	22 6	3 96	0 10 2
10	—	—	—	18 16	—	—

* Bulletin No. 3, 1903-4. † Loss.

It will be seen that the system adopted was to double the amount of one or more of the manures applied to Plot 9, and a careful comparison of the results shows that the effect of doubling the nitrate of soda was to increase the average yield of grain by 3 cwt. 47½ lb.; the application of twice the amount of kainit only increased the crop by 85½ lb.; while a doubling of the superphosphate actually produced a diminution in the crop of 25½ lb. The unsatisfactory average return from the larger dressings of phosphate is one of the most striking features of the trials. Attention was drawn to this in the barley experiments carried out by the Midland Institute in 1901, and it was then suggested that the cause of the smaller yields was an excess of phosphoric acid.

The largest crops were obtained on Plots 8, 6, 2, and 5, where 2 cwt. of nitrate of soda was applied in each case. The apparent excess of superphosphate on Plot 5 reduced the yield below that of Plot 2, and thus made this plot much less profitable than the other three. The dressing of Plot 2 showed 3s. 9d. more profit than that of Plot 6 with a larger crop, and 4s. 2d. more than Plot 8 with a still larger crop; that is to say, the differences in the cost of the manurings were not fully paid for by the increased yields. But these larger yields can only have used a small proportion of the extra manures, and they consequently may have a considerable residual value.

With regard to the effect of the manures on the quality of the barleys, it is observed that "it seems quite impossible to detect any difference in quality or value between the produce of the differently manured crop of the same trial. The quality appears to be virtually identical so far as appearance goes; whether chemically it would be the same is a matter for careful enquiry, particularly as from the point of view of yield the trials go to show the advantage of heavy nitrogen manuring. Whether the barley grown on these lines would yield a malt containing a higher percentage of nitrogenous matter is an important consideration and should receive investigation, as it would materially depreciate the value of the barley for malting and brewing purposes."

Experiments have also been carried out by the Yorkshire College* with a view of testing the same point as in the above

* Yorkshire College, Bulletin No. 37, 1904.

series, viz., the artificial manures most suitable for barley following on wheat, a rotation which is fairly general on medium and light loam soils in Yorkshire. The manures employed and the yields obtained in these tests, which were carried out in 1901 on two-acre plots, were as follows :—

Plot.	Manure.	Total Yield.	Increase Over Unmanured Plot.
		Bushels.	Bushels.
1	None.	49¼	—
2	1 cwt. sulp. ammonia	52¼	3
3	1 ,, sulp. ammonia 2 ,, superphosphate	55½	6¼
4	1 ,, sulp. ammonia 2 ,, superphosphate 2 ,, kainit	56¾	7½
5	2¼ ,, Damaraland guano	54	4¾
6	144½ lb. nitrate of soda 2 cwt. superphosphate 2 ,, kainit	59½	10¼

It will be seen that the "complete" mixtures applied to Plots 4 and 6 produced the greatest yields; this side of the experiment was referred to in this *Journal*, Vol. IX., p. 71, but subsequent investigations have been directed to the effect of manuring on malting qualities. The grain from each plot was malted, and a chemical examination was also made of the grain, with the results shown in the following table :—

Plot.	Grain.		Malt.	
	Percentage of Nitrogen.	Percentage of Potash in the Ash.	Extract per 336 lb. of Dry Malt.	Diastatic Capacity.
			lb.	
6	1·197	36·56	96·0	30·5
1	1·33	33·32	95·5	23·5
4	1·37	36·29	95·5	28·0
5	1·404	33·65	94·7	25·5
2	1·42	30·87	94·0	25·5
3	1·44	28·301	94·0	24·0

In view of the recognised relationships between the proportion of nitrogenous constituents in barley and its malting properties, the plots in the above table have been arranged according to the increasing proportion of nitrogen found in the samples. It

will be noticed that as the nitrogen increases there is a strikingly regular decrease in the percentage of potash, the amount of extract, and the diastatic capacity. The use of a nitrogenous manure for barley, therefore, does not appear to involve a correspondingly higher proportion of nitrogen in the grain provided it is accompanied, as in the case of Plots 4 and 6, by phosphatic and potassic manures. The nitrogenous manure alone, as in Plot 2, or when accompanied by phosphatic manure, as in Plot 3, adversely affected the quality, and the quality of the grain was only improved when "complete" mixtures were used. With the "complete" manure there was the lowest percentage of nitrogen and the highest proportion of potash, the highest proportion of extract, and the highest diastatic capacity. The investigations appear to show that a complete mixture of artificial manures may be relied upon in general to give the best yield of grain.

Use of Formalin for Smut.

The treatment of seed oats and barley for the prevention of smut by dipping in a solution of formalin is suggested in the Board's leaflet, No. 92, and some experiments carried out by Mr. D. McAlpine, Vegetable Pathologist to the Victorian Department of Agriculture, appear to show that this treatment is equally applicable in the case of wheat. Seed wheat was thoroughly infected with the spores of stinking smut, and divided into three portions, one being treated with bluestone solution, another with formalin, and a third left untreated. Bluestone (sulphate of copper) was used at the rate of 1 lb. in 5 gallons of water, and formalin at the rate of 1 lb. in 40 gallons of water. The result of the treatment was very conclusive. While the untreated plot contained at least 50 per cent. of smut, careful search over the treated plots failed to reveal a single smutty head. Thus both solutions were equally successful, but it was noticeable that the plot treated with formalin looked much better, and was a little further advanced. The same treatment was carried out with barley on a large scale, and while on the 20 acres treated not a single smutty ear could be seen, in the untreated portion there was not a single stook in which

several smutty ears could not be detected. Formalin being a colourless liquid and poisonous, must be kept where there is no danger of persons ignorant of its nature getting hold of it.

The use of formalin has also been investigated by several of the United States Experiment Stations, and in the North Dakota Experiment Station Bulletin it is stated that a small hand spray pump will be found very useful for applying the solution in the following way: Place the grain upon a water-tight floor or on a canvas, spray on the solution, and shovel or rake over the grain until it is seen to be evenly moist. Leave it for a few hours before sowing. The grain for seed should be measured before treatment, and again before seeding, to ascertain how the drill should be set in order to sow the required amount of the swollen seed. The strength of the solution recommended in this bulletin is 1 lb. of formalin to 45 gallons of water, and it is stated that this also prevents potato scab if the tubers are soaked in it for $1\frac{1}{2}$ hours before being cut for planting. A solution of 1 pint of formalin to 30 gallons of water, however, is recommended by the Ohio and Connecticut Stations. Particulars of experiments at Wisconsin Experiment Station were given in this *Journal*, Vol. IX., p. 366. In cases where formalin is used as suggested, the Board would be glad to learn how far its employment proves successful.

Grubs on Oats.

During the months of May and June of the present year the Board have had many enquiries addressed to them on the subject of injury to the oat crop by the attack of grubs. In every case the insect has proved to be the "Leather Jacket," which is the larval stage of the common "Daddy Long-Legs," or a nearly related species. This pest is fully described in the Board's leaflet, No. 11, copies of which may be obtained on application.

Although the particular grubs that did the damage in spring and early summer of the present year will not be in existence next year, they will, in the interval, have produced mature flies, and these, in the autumn of this year, will lay the eggs from which "Leather Jackets" will emerge to destroy next year's crops.

Although this pest attacks many crops it is most frequently really destructive to the oat crop, and especially to oats after grass or clover. The reason for this is that the "Daddy Long-Legs" has a special liking for depositing her eggs on grass or clover fields, and especially so where the herbage is rank. Prevention therefore must take the direction of making the fields so distasteful in some way that they will not prove attractive to the insect. Remembering that most of the eggs are laid in August and September, the following points should have the consideration of farmers :—

1. Grass and clover fields may be ploughed in June or July, care being taken that the grass is well covered. This system is not uncommon in certain districts, being known as bastard fallowing.

2. If it is not practicable to break up the grass or clover leys so early, they may be dressed in July with three or four tons per acre of gas lime.

3. If neither of these suggestions is feasible, leys that are intended to be broken up in autumn should be kept as close-grazed as possible.

If no method of prevention has been attempted, or if the result is not satisfactory, something in the nature of a cure may be attempted in spring, provided the attack is not very virulent and is taken in time.

Towards the end of April, and early in May, when spring-sown oats are 2 to 3 in. long, they should be dressed with 1 to 2 cwt. per acre of nitrate of soda, or with 1 cwt. of this manure mixed with 2 to 3 cwt. of soot. After dressing, the land should get a double-harrowing, and a thorough rolling with a heavy Cambridge roller. The harrowing brings a considerable number of the grubs to the surface, where they are preyed on by rooks, starlings and other birds, and the roller kills a considerable proportion.

If towards the end of May it is considered that the crop is practically a failure it should be ploughed up, and towards the end of June white turnips, rape, or mustard may be sown. By that time the "Leather Jackets" are getting into a quiescent condition, and are not likely to damage the new crop, and if the weather is favourable the crops indicated will keep down weeds and yield useful green food for autumn feeding.

Effect of Bad Weather on the Vitality of Seed Oats.

In March last the attention of the Board was drawn by one of their correspondents to the low germinating power of much of the grain saved for seed in Aberdeenshire from the previous harvest. Opportunity was taken to draw the attention of farmers to the matter, and the Board are informed that oats were more thickly sown in consequence, and where the crop has not been destroyed by grub the result is fairly satisfactory.

Some tests have been carried out by Mr. R. B. Greig, F.H.A.S., of the Agricultural Department, Marischal College, Aberdeen, with a view of ascertaining how far the unseasonable harvest weather of 1903 has affected the vitality of the grain intended for seed in 1904. Mr. Greig was induced to undertake these tests in consequence of the fact that in the spring of 1903 many fields of oats in Aberdeenshire brairded badly and ploughing and resowing was necessary in certain cases. It was generally believed that the thin braird was due to an unusually bad attack of the grub of the "Daddy Long Legs." There appears to be no doubt that much harm was done by these larvæ, and by wireworms, but it seemed possible that the thin appearance of many of the fields might be due to inferior seed, and that the inferiority of the seed was caused by the bad harvest weather of 1902. In one field, for example, partly sown with seed obtained from the south and partly with local seed, the difference in favour of the purchased seed was very marked.

Most of the samples tested were taken from the seed stack or from the heap in the granary intended for sowing. Practically all were specially selected because they had been exposed for a longer or shorter time to bad weather in stook.

The germinator used was specially constructed, but was imperfect in that it had no thermostat or apparatus for regulating the heat, and so it was difficult to keep the temperature quite uniform. This did not apparently have any practical effect, and from a number of duplicate tests, and from tests with sound, well-ripened seed, Mr. Greig is of opinion that the results obtained are approximately correct. Out of thirty-four samples, the highest individual germination was 63 per cent., and the lowest

16 per cent., excluding one that germinated only 7 per cent.; the average germination was 34 per cent. These figures were not the highest germinating power of many of the samples, for the following reasons :—Most of the samples had been slightly heated or were musty, that is to say, they had been exposed to fungoid growth in the stook, the stack, or the granary. In order to keep the conditions as natural as possible, the outsides of the seeds were not sterilised, and often, in spite of careful sterilisation of the material, in forty-eight hours a thick growth of fungi would arise. In this way, no doubt, many of the grains were killed before the radicle was visible, and examination showed that many others were attacked and killed immediately after the radicle appeared.

In the second place, the grains were not selected, but counted out as they came to hand, large and small together; some samples of selected grain germinated at least 10 per cent. better than the unselected. It must be remembered also that the samples were not supposed to be good seed, but only grain that was intended for seed.

The suggestion that there is a relationship between the duration of exposure to bad weather and the vitality of the seed is supported by the following figures, relating to samples which were in the stook from three to six weeks in rainy and misty weather :—

No. of Samples.	Weeks in Stook.	Average Germination. Per cent.
6	3	40
8	4	33
6	5–6	29

A number of samples were said to have been cut "green" or "with a tinge of green." The best of these germinated 61 per cent., and the worst 14 per cent., with an average of 38 per cent., and there is no evidence that the cutting when green affected the germination. In the same way, seven samples of frosted grain were tested and germinated from 21 to 57 per cent., with an average of 40 per cent.

The relation between the weight per bushel and the germinating power is shown by the following figures :—

No. of Samples.	Weight per Bushel.	Germinating Power. Per cent.
11	35 to 40 lb.	26
6	$40\frac{1}{2}$ to 46 lb.	40

The effect of the harvest weather in Aberdeenshire seems to be indicated also by the fact that seed of the "Thousand Dollar" variety taken from the same bulk was sown in 1903 both in Aberdeenshire and Cambridgeshire, and seed from the Aberdeenshire crop germinated 63 to 73 per cent., while that from the Cambridgeshire crop germinated 91 to 92 per cent.

Stem Eelworm. (*Tylenchus Devastatrix.*)

An account is given in Leaflet No. 46 of the Stem Eelworm (*Tylenchus devastatrix*), which recently has been reported as affecting oats in Scotland. In addition to the remedies therein suggested, the Board are advised that the use of the following dressings have been found to be successful in combating this pest:—(1) Sulphate of potash at the rate of 1 cwt. per acre. This stopped tulip root, and was followed by a good crop. (2) Sulphate of ammonia 4 parts, sulphate of potash 1 part, steamed bones 2 parts, applied at the rate of $1\frac{1}{2}$ cwt. per acre, and followed by a dressing of 2 cwt. per acre of sulphate of ammonia. (3) At Rothamsted, a good result was got with sulphate of potash 3 cwt. per acre, sulphate of ammonia 1 cwt. per acre. A number of other plants are attacked by this worm, including wheat and clover, but not barley.

Experiments with Swedes.

A series of experiments upon similar lines were undertaken by the Agricultural Department of the Reading College upon thirty farms in Berks, Bucks, Dorset, and Oxfordshire. The scheme was devised as a preliminary step towards a more complete examination of the manurial and other requirements of swedes, which it is hoped will be undertaken in subsequent years. One of the chief objects of the work is to determine the leading requirements in regard to the fertilising constituents needed by swedes upon the particular soil on which the trial is made. Ultimately it is hoped to obtain general rules applicable to the

crop when grown upon definite types of soil, but the results of the first year present several features of interest, and the fact that the results given below represent averages of such a large number of experiments appears to render them of special value. At each centre half an acre of land was divided into eight parallel strips, each 1-16th of an acre in extent, and the manures were applied to these plots, as shown in the following table :—

No. of Plot.	Amount of Manure per acre.			Cost per acre.	Average increase per acre.
	Sulphate of Ammonia.	Super-phosphate.	Sulphate of Potash.		
	lb.	lb.	lb.	s. d.	Tons.
1 and 5 (no manure)	—	—	—	—	—
2.	51	250	40	16 9	2·9
3.	102	500	80	33 6	4·8
4.	204	1,000	160	67 0	7·1
6.	—	500	80	22 0	4·0
7.	102	—	80	18 6	1·9
8.	102	500	—	26 6	5·2

On Plots 2, 3 and 4 mixtures of manures containing the three necessary ingredients, nitrogen, phosphates, and potash were used, the amount on Plot 3 representing an ordinary, dressing of each, while on Plot 2 half this amount and on Plot 4 double the same were tried. A comparison of the yields and the cost of producing them will show which was the most economical. By comparing Plot 3 with Plot 6 the influence of the addition of nitrogen is seen. The effect of the want of phosphates is shown by a comparison of Plot 7 and Plot 3. The fact, however, that Plot 8 produced a larger crop without potash than Plot 3, which received 80 lb. of sulphate of potash per acre, is a point which seems worthy of further investigation.

From the results obtained on Plot 7, it is clear that to increase the crop by the application of manures which do not contain phosphates is an expensive unremunerative process. In fact, on twenty-two of the farms out of the twenty-six from which complete returns were obtained, the omission of phosphates resulted in a very large diminution of the crop, and in many cases the yield was little better than where no manure was applied.

The number of roots on each plot and the regularity of the plant was very distinctly influenced by the amount of manure applied. In the majority of cases the unmanured plots grew a small number of roots at very irregular intervals. The most regular plant was obtained on Plots 3 and 4, where scarcely a root failed. Unless the young seedling swede obtains soluble, available nutriment soon after germination, it is exceedingly likely to die or become very much weakened by its early struggle in life.

Experiments in the manuring of swedes have also been carried out by the Midland Dairy Institute at five centres in Nottinghamshire and Derbyshire, and the results obtained admit of comparison in some respects with those recorded above. In both cases it must be remembered that the season of 1903 was not the most favourable. The following table shows the manures applied and the average results obtained at the five centres :—

No. of Plot.	Amount of Manure per acre.			Average yield on five farms per acre.		Increase compared with unmanured plots per acre.		Profit per acre.	
	Nitrate of Soda.	Superphosphate.	Kainit.						
	lb.	lb.	lb.	Tons.	cwt.	Tons.	cwt.	s.	d.
2.	—	448	—	12	8	4	0	29	0
3.	168	448	—	14	$8\frac{3}{4}$	6	$0\frac{3}{4}$	34	4
4.	168	448	224	14	$3\frac{1}{2}$	5	$15\frac{1}{2}$	26	9
5.	336	896	448	17	$17\frac{3}{4}$	9	$9\frac{3}{4}$	32	10
12.	180	402	147	15	2	6	14	37	10

The crop was valued at 10s. per ton, so that the use of 11s. worth of superphosphate on Plot 2 shows a profit of 29s. per acre, while on Plot 3 the profit was increased to 34s. 4d. by the addition of $1\frac{1}{2}$ cwt. of nitrate of soda. On Plot 4, however, the further addition of 2 cwt. of kainit resulted in a reduction of the produce, and, as has been pointed out, a similar result was obtained in the Reading experiments, where a smaller yield was obtained with a potash manure than without. In the case of the Midland experiments, Mr. Blackshaw observes that "It is known that a wet season reduces the effect of kainit, but even after making allowance for the excessive rainfall, the result

obtained is not what might have been expected." In this connection it is interesting to notice that Plot 12, which was dressed with a manure containing the equivalent by analysis of a compound manure, gave a greater yield than either Plots 3 or 4; this manure, it will be seen, contained less potash and rather more nitrogen than Plot 4. Plot 5, which received a heavy dressing, gave a good result. The yield obtained is more than double the crop of the unmanured plots, and is the heaviest of any of the plots. The profit is not quite so much as on Plot 3, but if the condition in which the land is left is taken into consideration, preference must be given to the heavier dressing.

Tests were also made on five plots at five farms with a view of ascertaining what was the best artificial dressing to use with 10 tons of farmyard manure, and also whether a combination of this sort was to be preferred to a heavier dressing of 15 tons of dung.

No. of Plot.	Amount of Manure per acre.				Average yield on five farms.	Increase compared with unmanured plots.	Profit due to Artificial Manures (per acre).
	Dung.	Nitrate of Soda.	Super-phosphate.	Kainit.			
	Loads.	lb.	lb.	lb.	Tns. cwt.	Tns. cwt.	s. d.
6.	15	—	—	—	13 16½	5 8½	—
7.	10	—	—	—	12 15½	4 7½	—
8.	10	—	448	—	15 8½	7 0½	15 6
9.	10	168	448	—	17 6½	8 18½	19 6
10.	10	168	448	224	14 14	6 6	11 6*

* Loss.

The additional five loads of farmyard manure used on Plot 6 compared with Plot 7 only produced an extra ton of swedes, while the fertilisers applied on Plots 8, 9, and 10 resulted in an increase, compared with Plot 7, of 2 to 4½ tons. On Plot 10, however, as on Plot 4, the addition of kainit had an injurious effect, and considerably reduced the yield. In regard to this, it is observed in the report that "Although such a result as this is not so entirely unexpected when kainit is used in addition to farmyard manure, still it is more the exception than the rule; in fact, in an ordinary season, kainit would probably have had a beneficial effect."

Comparing these plots, however, with those which received

artificials only, it would seem that while the addition of 10 tons of farmyard manure, as in Plots 8 and 9, to the mixtures applied to Plots 2 and 3, resulted in considerably larger crops, the effect of the manure when added to a mixture containing potash, as in the case of Plot 10, produced only a very trifling effect.

In this connection reference may be made to some experiments at Yorkshire College, which were summarised in this *Journal*, Vol. VII., p. 201, September, 1900; in these experiments it was found that the addition of 2 cwt. of sulphate of potash to 10 tons of dung, 4 cwt. superphosphate, and 1 cwt. of sulphate of ammonia, resulted in a reduced yield. The conclusion which Professor Campbell came to was that where dung is applied, the application of nitrogen and potash in the form of artificials is unnecessary, but where farmyard manure is not applied, not only the nitrogen, but also the potash, must be included in the mixture.

The Cabbage Moth. (*Mamestra brassicæ*, Linn.)

The caterpillars of the cabbage moth (*Mamestra brassicæ*) are a great pest in gardens all over Great Britain and Ireland and did much harm in 1903 in parts of the south of England. They are chiefly a cabbage pest, but they also attack a great variety of other plants, such as turnips, radishes, broccoli, cauliflower, strawberries, lettuce, currants, dahlias, mallows, marigolds, roses, geraniums, dock, goosefoot, tobacco plants. They are fond of maize, feeding amongst the male flowers, and by attacking the female spikes destroy the brush crowning them. In fact nearly all plants are devoured by this pest. The caterpillars are very greedy, and spoil as well as eat the plants.

The cabbage moth appears on the wing during the whole summer. The fore wings are dark grey, varied with black, with many blackish streaks and marks; the hind wings are brown, pale at the base with a whitish fringe; thorax the same colour as the fore wings, the abdomen brown with more or less distinct tufts down the back, the tip being distinctly tufted; the legs are brown and very hairy at the base. The wing expanse reaches

about one and three-fourths of an inch, and the length of the body nearly or quite three-fourths of an inch. The moths fly at dusk and at night, remaining at rest upon tree trunks palings, &c., during the day. They may also be found nestling against the sides of clods and stones in fields.

The eggs are laid on the leaves of plants, especially cabbages, and hatch in six or seven days. The caterpillars, like the moth, are very varied in colour (apparently depending upon the plants which form their food). When young they are always green, but as they grow the colour changes : some remain green, others become greyish-green, and some almost black on the back and yellowish above the feet ; below they are greenish-grey. There is sometimes a prominent dusky line along the back. The head is ochreous and horny, and the first segment is blackish ; the legs and prolegs are all green, and the spiracles pure white. When full grown they reach an inch and a quarter in length ; the grown caterpillars roll themselves up into a ring if touched.

The method of feeding varies according to the plant attacked. When the larvæ are on cabbage they eat their way into the heart of the plant, no matter how solid, and defile it with moist green excreta (" frass "), which gives the cabbage a most disgusting appearance. Plants may be completely riddled by them. When attacking turnips, &c., they devour the leaves down to the midribs.

When mature the caterpillar either enters the ground to pupate, or may change on the surface, or under a stone or tile. The pupa is shining chestnut brown with occasional darker areas ; it may be placed in a cell of earth, or it may be naked in the soil. Most of the caterpillars have pupated by the late autumn, but some only do so in the next spring. They may even be found in cabbages during the winter.

All chrysalids should be destroyed when the ground is dug in winter. If large areas of cabbage have been attacked it would be well to turn poultry on the land ; in garden cultivation, digging in the winter would turn up the chrysalids, and these could be collected or birds turned in.

Handpicking, before the caterpillars have left the outer leaves and eaten their way into the heart, should also be practised.

Cabbages may be dusted with gas lime that has been exposed to the air for three months or so : the lime runs down into the cabbages and makes them obnoxious to the larvæ without harming the plants, though it necessarily renders them less suitable for feeding or culinary purposes.

The Pea Beetle.*
(*Bruchus pisi.*)

These beetles attack peas only, although a closely allied species, *B. rufimanus*, attacks in a similar way the bean. They are very destructive, their presence being harmful because they interfere with and may prevent germination, while if the seeds do germinate the resulting plants are often weakly. The beetles, moreover, fly well in sunshine, and spread to other pea crops for their egg laying.

As a preventive measure, peas should not be sown which contain the pest. It has been stated that the attacked peas can be separated from the healthy by placing the sample of peas in water, when the healthy ones sink while the infected ones float. This statement is not wholly trustworthy. In experiments with sound and attacked peas it was found that healthy sound peas sink at once, but that peas with holes in them from which the beetles had issued, and those with the outer skin broken but with the beetle still *in situ* may float for a short time, but ultimately they all sink. Peas with the outer skin unbroken and containing the beetle, on the whole, continue to float.

The best mode of killing the pest in the pea is by fumigating the peas with bisulphide of carbon. The method is to enclose the peas to be treated in an airtight box or chamber ; then place some bisulphide of carbon in a saucer or open dish laid on the *top* of the peas, and allow it to remain for 24 hours. One ounce of bisulphide of carbon would do for every 40 cubic feet of space. Bisulphide of carbon fumes are poisonous, and must therefore not be breathed by the operator, nor must a light of any kind be brought near.

* An account of this beetle was given in the *Journal*, Vol. II., September, 1895, p. 164.

Government Stud Bulls in New South Wales.

The importation of pedigree dairy cattle by the New South Wales Government was begun a few years ago in response to the repeated requests of the leading agricultural societies in the dairying districts of the Colony. The local dairy breed, called the South Coast cattle, is of the milking Shorthorn type, and in every way suited for Colonial dairying, but the best milking strains have been, it is stated, too closely interbred to maintain for any length of time that vigour and robustness which is so essential a requisite in every breed of cattle. It was consequently recognised that the introduction of fresh stock was necessary to impart the additional stamina required by the native herds, but a stipulation was made that the animals purchased should possess a good frame and constitution, combined with strong milking qualities, and should not be merely highly bred pedigree stock. Considerable difficulty was experienced as regards the distribution of the imported bulls, as the climate and soil of the various divisions of the country and the importance of the local dairying interest had to be taken into consideration. Very satisfactory results have, however, already been obtained, and the bulls leased to the farmers appear to be increasing in favour and popularity.

The conditions under which the bulls are leased are indicated in the following *resumé* of the official regulations :—Any agricultural society, dairy farmer, or a combination of dairy farmers, may obtain the hire of a bull for a period of six months, if payment for the service of thirty cows is guaranteed, or for shorter periods on special terms. The fee is at the rate of five shillings per cow for all bulls except Dexter-Kerries, for which two shillings and sixpence is charged. No animal is forwarded before payment. Bulls are transferred free of charge within 100 miles by rail, and the lessee pays extra charges beyond that distance. In the case of bulls sent by sea, or partly by rail and partly by sea, all expenses over the sum of £1 are also to be borne by the lessee, who must make all arrangements for, and bear all expense of, transferring a bull from the nearest railway station or port to the place where it is to be stationed In the case of a bull already stationed within the district, the new lessee must send for the bull and bear the expense of removal.

Farmers are allowed to send cows to the bull at a fee of not more than 10s. per cow, provided the list is not already full. The total number of cows served must not be more than thirty for six months. Each bull must be treated and kept in a condition satisfactory to the authorities, who reserve the right to inspect the animal at any time. No Government bull may have access to cows suffering from any infectious disease, especially pleuro-pneumonia and tuberculosis; and no farmer who has pleuro-pneumonia in his herd is permitted to send cows within three months from the date of the last outbreak. The bull is not to be allowed to run with cows, but it must be kept in a special and well-fenced paddock.

The Government stud bulls available for hire or for service at the State farms in New South Wales are now thirty in number, and they include animals of the following breeds: Shorthorn, Jersey, Guernsey, Red Poll, Ayrshire, Kerry, Dexter-Kerry, and Holstein.

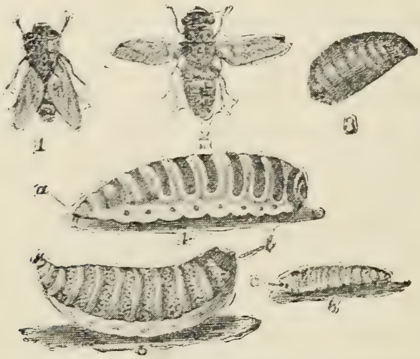
The Sheep Nostril Fly.

The Sheep Nostril Fly (*Oestrus ovis*) belongs to the family Oestridæ or Bot Flies. The mouth parts of the bot-flies are either abortive or rudimentary, so that as adults they do not feed; the harm is done by the larva or maggot which is parasitic on one of the higher vertebrates, the host—man, horse, ox, sheep, deer—varying with the species of bot-fly.

The sheep nostril fly has a wide distribution, and the harm done by its maggots is known to flock-masters in Britain from north to south.

The somewhat hairy fly (Figs. 1 and 2) measures about half an inch in length; the upper surface of the head is light brown, and of the thorax light brown or yellow to grey with dark tubercles; the ringed abdomen is brown yellow with dark spots. The legs are brown. The wings are glassy, and extend, when the insect is at rest, beyond the body. The balancers (behind the flying pair of wings) are white, and are covered by well-marked winglets, these winglets being present at the hind margin of the flying wings.

The flies leave their shelter places in sunshiny warm weather, both sexes for pairing, and afterwards the females fly towards the sheep. The eggs are somewhat curved or kidney-shaped. The newly hatched maggots (Fig. 6) are very small, white and worm-like, becoming longer and rounded as they grow; they have two backwardly directed hooks at the head end, between which is the mouth; along the under surface of the abdomen are transverse rows of little projections; on the free end of the last segment are the spiracles or openings of the breathing tubes, below these is a lobe with spines, and on each side a little process, spines and processes playing their part in the move-



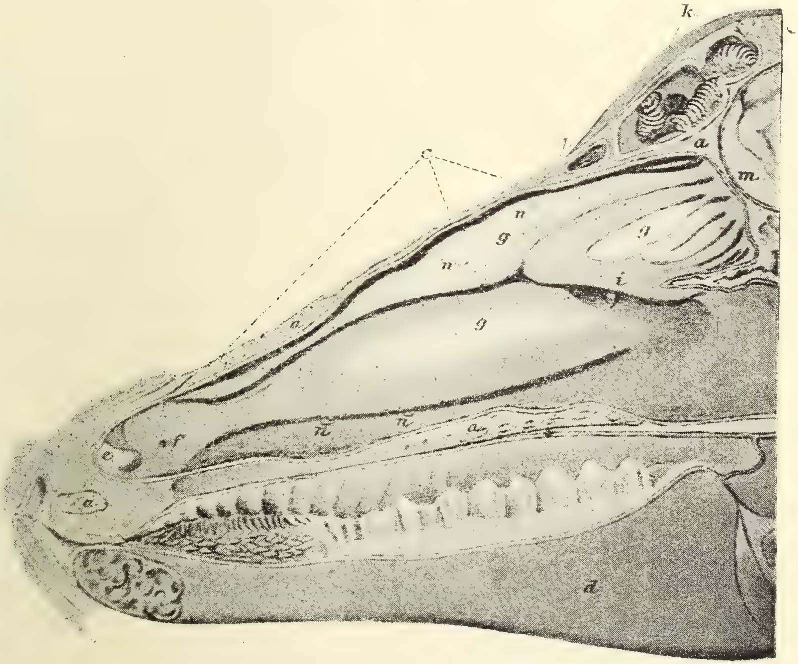
THE SHEEP NOSTRIL FLY (after RILEY).

ment of the maggot. The full-grown maggot (Figs. 4 and 5) measures between three-quarters of an inch and an inch.

Life History.—The females deposit their eggs ready to hatch, or newly-hatched maggots, at the sheep's nostril, and the maggots by their mouth hooks and anal processes and spines draw and push themselves up the nostrils (*e*), the pricking and wounding of the lining mucous membrane causing the attacked sheep much irritation. The larvæ feed on the secretions resulting from the irritation caused by their presence and their prickings, and become mature in the frontal (*k*) and maxillary sinuses of the sheep. Occasionally maggots, wandering into the recesses of the turbinated bones (*gg*), become with their increase in size imprisoned there, and undergo degeneration. Ultimately, the full grown larvæ returning to the passages are sneezed out on to the ground, where a little below the surface, or under a clod, or sheltered in a tuft of grass, the pupation stage (Fig. 3) is passed, the

fly maturing under the cover of the last moulted dark-coloured skin of the mature larva. The flies are found at work in the summer months, and the length of larval life is given at nine or ten months. The number of maggots in a head varies, but a small number is commoner than a large; maggots of very different sizes and in different stages of development may be found at the same time in the same head.

The following quotation of Bracy-Clark's, from the 1797 Volume of the Linnæan Society's *Transactions*, describes the



SECTION OF SHEEP'S NOSTRIL (after CURTICE).

behaviour of the sheep when their enemy is at work:—"The moment the fly touches the nose of the sheep they shake their heads and strike the ground violently with their forefeet, at the same time holding their noses close to the earth, they run away, looking about them on every side to see if the fly pursues; they also smell to the grass as they go lest one should be lying in wait for them. If they observe one they gallop back or take some other direction. As they cannot, like the horses, take refuge in the water, they have recourse to a rut, dry dusty road or gravel-pits, where they crowd together during the heat of the

day, with their noses held close to the ground, which renders it difficult for the fly to get conveniently at the nostril."

Symptoms Attending Infestation.—Discharge from the nostrils of the infected sheep, sneezing and snorting in the endeavour to get rid of the larvæ, tossing of the head, rubbing noses on the ground and with their feet, high stepping, a staggering gait, difficulty in breathing. There is a loss of condition attendant on the constant irritation.

Treatment.—In combating the sheep nostril fly prevention is to be aimed at rather than later remedial measures.

1. The fly may be deterred from its egg and maggot laying by repeated dressings of the nostrils of the sheep, with such materials as tar or fish oil. This is an onerous task, hence there are contrivances for making the sheep dress themselves by having in the pastures salting troughs made in the shape of the letter V ; the sides of the V are smeared with tar, and the sheep get the tar on their noses as they lick the salt ; or the boxes containing the salt are closed, save for a hole painted over with tar.
2. Where a pasture is known to be infected the sheep should be removed from the meadow before the flies issue from the pupa cases.
3. Infested sheep should be isolated so that the maggots when mature may not be sneezed out on to the pasture. To prevent further development the maggots when seen should be destroyed.
4. In very bad cases the sheep should be sent for slaughter.

Remedial measures are not of much avail, and may be too troublesome and expensive to be generally practised, save with valuable prize sheep. Such measures consist of fumigation to kill the maggots or induce a violent sneezing, which may result in the maggots being ejected ; injecting up the nostrils fluids, which, if they reach the maggots would kill them ; trephining—cutting into the cavities where the maggots are resident and picking them out.

Acute Rheumatism in Lambs.

The Board recently had their attention drawn by one of their agricultural correspondents to a complaint affecting sheep on a farm in Sussex. This farm consisted of 1,000 acres of upland and marsh. About 300 ewes were lambed down each year, and several hundred Southdown lambs were also bought in in the autumn to be sold as ripe stores or fat in the following spring and early summer.

The complaint was only noticed in wet years among lambs purchased from the Sussex hills, which were folded on turnips in October and November, also getting cake and corn. It was described as producing stiffness in the early stages, knuckling of the joints, contraction of the tendons of fore and hind limbs, movement being very painful and, in the worst cases, death would occur in a few days. If these sheep were taken in the early stages off the turnips and placed on the drier uplands they usually recovered. This disease did not seem very general, but it appeared in a few farms last winter, and caused slight losses. From the description given of the symptoms, and from the fact that it was only noticed among folded sheep in wet years, when they are receiving a highly nutritive acid-forming food, the Board's Veterinary Inspector, who inquired into this case, came to the conclusion that the disease was acute rheumatism.

A teg which had been ill for some time, apparently from chronic rheumatism, was killed, and a post-mortem examination made. This lamb had quite lost the use of its limbs, its tendons were very much contracted and the joints enlarged, but the viscera proved quite healthy. The tendons were so contracted that the limbs were pulled into fantastic shapes, and in some tendons salts had deposited, being quite gritty to cut.

All the synovial surfaces of the joints were erroded, in some cases errosion had extended to cancellated tissue at the ends of the bones, in which degenerative changes were taking place. In some cases the ulcerative process had healed, a white porcelain-like deposit being found on synovial surfaces of the joints. In opening up the spinal cord it was found that all the lumbar vertebræ had ankylosed, and that adventitious bone formation had so secluded the neural canal that the outline of

the cord was barely discernable, and so degenerated that complete paralysis of the hind extremities must have resulted.

This disease does not appear to assume large proportions—in bad years about 6 to 8 per cent.—and it is a disease which should yield or be lessened by the removal of the cause, viz., damp lying and highly nutritive foods. The removal of sheep showing the first symptoms of stiffness to dry uplands is recommended. A half a drachm of bi-carbonate of soda might be given to them morning and night (for a few days) in a little corn cake and chaff; the cake and corn should be less than the sheep had been receiving, but it would not be wise to stop it altogether, as condition once lost is hard to recover. In very wet spells the sheep might be taken off the turnips on to grass at night, if grass is handy. If the stock is suffering severely it would be wise to take them off the turnips on to grass and to cart the turnips to them.

Production and Consumption of Meat and Dairy Produce.

The Committee* appointed by the Royal Statistical Society in November, 1900, to inquire into the statistics available as a basis for estimating the production of meat and milk in the United Kingdom, have recently concluded their investigations. At the beginning of their inquiry, the Committee came to the conclusion that it was desirable, if possible, to collect entirely fresh data, with the view of either revising the calculations already existing, or, if necessary, of constructing new estimates, and schedules asking for information on various points were sent to large numbers of farmers, butchers, meat salesmen, and others. An attempt was also made to collect definite statements of the consumption of meat and dairy products in separate households. As a result, it is believed that a much more substantial basis of ascertained facts has been accumulated than has been previously available,

* The members of the Committee were:—W. H. Barfoot-Saunt, Sir James Blyth, Bart., Major Craigie, C.B., R. F. Crawford, A. Wilson Fox, C.B., Professor W. Fream, LL.D., George Goodsir, R. Henry Rew, H. Llewellyn Smith, C.B., W. Somerville, D.Sc., G. Udny Yule, Benedict W. Ginsburg, LL.D.

and the Committee consider that the facts elicited are sufficient to enable a reasonable judgment to be formed which may be accepted as representing a tolerably close approximation to the facts.

The general result of the inquiry suggests that the following quantities represent on an average of the five years ending June, 1903, the estimated annual production of meat and dairy products in the United Kingdom :—

	Tons.
Beaf and veal	662,520
Mutton and lamb	313,822
Bacon and pork	269,578
Total meat	1,245,920
Cheese	68,300
Butter	156,250
	Gallons.
Milk (for consumption as such)	620,000,000

The estimated average consumption per head of these commodities, including imported supplies, is as follows :—

	Home Produced.	Imported.	Total.
	lb.	lb.	lb.
Beaf and veal	35·9	20·9	56·8
Mutton and lamb ...	17·0	10·5	27·5
Bacon and pork... ...	14·6	22·2	36·8
Total meat	67·5	54·3	121·8
	Gallons.	Gallons.	Gallons.
Milk	15·0	—	15·0
	lb.	lb.	lb.
Cheese	3·7	6·8	10·5
Butter	8·7	9·8	18·5

In the case of meat these totals are adjusted by deducting the exports and adding the " meat unenumerated," which cannot be apportioned. The imported supply of cheese and butter is less exports.

It is necessary to remember that these figures do not purport to represent literally the whole consumption of meat and dairy

products. There is a certain quantity of meat, comprised in what butchers term the "fifth quarter," which is not included, and a considerable quantity of poultry, game, and rabbits must also be added. In the case of milk the small consumption per head among the wage-earning classes is, to some extent, supplemented by separated or skim milk in the rural districts and by condensed milk in the poorer urban districts.

The methods of calculation by which these figures are arrived at are explained in detail in the Committee's Report. In the case of meat the numbers of cattle, sheep, and pigs annually slaughtered for food are first ascertained as follows:—To the total number enumerated in the agricultural returns at the beginning of the year, the estimated number born during the year is added; from this total the estimated number of deaths by accident or natural causes, the number exported during the year, and the number surviving at the end of the year (*i.e.*, the total number returned) is deducted, and the remainder is the number slaughtered for food.

The result showed that on a quinquennial average the proportion of the total number of animals enumerated in agricultural returns slaughtered annually for food was: cattle, 27 per cent.; sheep, 38 per cent.; pigs, 121 per cent.

The attempt to arrive at an average weight per carcase of live animals when killed presented greater difficulties than the calculation of numbers annually slaughtered. The Committee, however, obtained a large amount of data on this point, and their conclusions gave a dressed weight per head of 660 lb. for cattle, 95 lb. for calves, 65 lb. for sheep, 40 lb. for lambs, and 135 lb. for pigs.

In considering what figure should be adopted as the average yield of milk per cow, the Committee came to the conclusion that after allowing for calf-rearing, the average yield per cow and heifer enumerated could not be placed at a higher figure than 430 gallons for Great Britain.

In the case of Ireland the figure of 400 gallons per cow given in the Irish agricultural statistics for 1902 was accepted, and as the cows and heifers enumerated in Ireland formed about 36 per cent. of the total, the adoption of 400 gallons for Ireland and 430 gallons for Great Britain, gave an average of about

420 gallons for the United Kingdom. The average annual total production of milk is, therefore, shown as follows :—

Average number of cows and heifers annually enumerated (1899–1903)	4,103,000
Estimated average yield	420 gallons.
Total production of available milk per annum	1,723,000,000 ,,

As the average population of the United Kingdom for the five years ending May 31st, 1903, was estimated at 41,338,000, the milk available for consumption in one form or another is estimated to amount to nearly 42 gallons per head per annum.

The 1,723 million gallons arrived at as the estimated total production of available milk in the United Kingdom is, it is considered, consumed as follows :—As milk, 620,000,000 gallons; as cheese, 153,000,000 gallons; as butter, 944,000,000 gallons; and as condensed milk, &c., 6,000,000 gallons.

As a guide to the conversion of the milk used for cheese and butter into the weights of those commodities, the replies received to the inquiry of this Committee on this point are valuable. They numbered 143, and gave averages of $8\frac{1}{5}$ pints to 1 lb. of cheese and 21 pints to 1 lb. of butter, and round figures of 8 and 21 pints were adopted. In Ireland the records of 122 creameries show an average of 2·42 gallons (= 19·36 pints) per lb. of butter, but, on the other hand, in the majority of farm dairies, where the separator is not used, the amount required would be greater.

The Reports also contain a quantity of valuable and interesting information as to the consumption of meat and dairy products by individual households.

Fishy Butter.

The *Agricultural Gazette* of New South Wales has recently referred to the occasional prevalence in Australian butter of a fishy flavour which causes much injury to the industry. Information on this subject has already been published in this *Journal*.* The flavour is due to a small mould called *Oïdium lactis*, which grows conjointly with the ordinary organism which causes

* Vol. VIII., p. 57, June, 1901.

the souring of milk. This mould is commonly found in old or stale milk, showing that milk and cream are probably one of its chief habitats. The dairy expert to the New South Wales Department of Agriculture—Mr. O'Callaghan—therefore advises farmers to do away with all receptacles in which old decomposed milk is kept. It is a common thing, he says, to find what is called the "pig tub" just outside the dairy door. This pig tub is partly emptied each day for the purpose of pig feeding; but, unfortunately, it is seldom thoroughly cleaned, and a breeding-ground for undesirable organisms is thus constantly kept in close proximity to the cream.

Mr. O'Callaghan has found the mould in old timber buildings, and he states that dairies with timber roofs, without ceilings, not frequently washed with quicklime or some disinfectant, are common centres of infection. The mould resting on old timber slabs bespattered with milk or cream does not cause any noticeable smell. The spores or seeds fall into the cream and cause trouble in due course, and when a district becomes thoroughly infected the good often suffer with the bad. Like most microbic troubles, human and otherwise, this butter disease may be spasmodic. It suddenly appears in districts where it was never heard of before, and it may disappear just as suddenly as it came, to recur again at a favourable opportunity.

Danish Butter Quotations.

It has been announced in the *Danish Butter Trade Journal* (*Smör Tidende*) that the publication of the particulars of the Danish weekly butter prices is to be discontinued, and that, from the 1st July, only one figure will be made known to the public, viz., the average weekly price received by all the reporting dairies, expressed to one place of decimals, in kroner per 100 Danish pounds. It appears that the publication of a single exceptionally high price paid for a special brand of butter induces dairies in general to demand a similar return for their butter. The above-mentioned reform has been made at the request of a committee representing the agricultural and dairy societies in Denmark.

The following instructions for the manufacture of Edam cheese are given in the Report of the New Zealand Department of Agriculture for the year 1903:—

Edam Cheese.

In manufacturing this variety of cheese lactic acid is developed, as in the Cheddar system, and the rennet test is used in determining the acidity for setting. Enough rennet is used to coagulate the milk in about fifteen minutes at temperatures from 90 degrees to 96 degrees, varying with the season. The cutting is, under modern conditions, done with the ordinary curd-knives. Firmness in the curd is brought about as in the Cheddar system. When the curd shows strings from one-eighth to three-sixteenths of an inch in length on hot iron the whey is removed, and the curd stirred dry without being allowed to mat. It is kept in this granular condition until sufficient acid has developed to make the curd show strings about one inch in length. At this stage the curd is placed in semi-globular moulds, and is packed as hard as possible with the hands. The covers are then put on the moulds, and the curd is pressed for about one hour before dressing. The dressing is done by putting a bandage of cheese-cloth wetted with warm water around the cheeses, and a small cap on each end. The cheeses are then put back to press for eighteen to twenty hours; they are then taken out, and after being rubbed with salt are placed in moulds of the same shape as those used in pressing, although somewhat larger in size. A thin layer of salt is put on the bottom of these moulds, and the cheeses are turned daily, fresh salt being added each time until the cheeses feel hard. This process generally takes from seven to ten days, after which the cheeses are placed on the curing shelves.

The length of time occupied in curing and the excessive handling entailed by the process, owing to such a small amount of curd being in each cheese, are perhaps the two greatest disadvantages connected with the manufacture of this variety. The comparatively large percentage of salt absorbed by these cheeses, causes the process of curing to advance slowly, and to ensure the proper maturing of the cheese and the development of that fine flavour which is its prominent characteristic, it is almost necessary that the curing should continue from eight to twelve months if good results are desired. The conditions required for

curing are practically the same as those required to give best results in the Cheddar system, viz., temperature not exceeding 65 degrees, and a relative humidity of from 70 degrees to 80 degrees. Edam cheese, which takes its name from a town in North Holland, is one of the two most popular varieties of Dutch cheese. It withstands the effect of high temperatures better than most varieties, and for this reason it is largely exported to tropical countries.

The Board have received from Mr. Charles Whitehead, F.L.S., one of their Agricultural Correspondents, the following report on fruit prospects in Kent:—

Fruit Prospects in Kent.

Cherries.—In the very important cherry orchards in East Kent the fruit is much below an average. In many places it is only about a third of an average crop. Here and there in the Maidstone and Weald of Kent district there is a better crop, but these orchards are comparatively few compared with those in East Kent. The blossom was abnormally abundant everywhere, but birds, insects, and east winds caused much harm. The previous wet autumn and winter also weakened the trees. The price of cherries has not been satisfactory considering the shortness of the crop. The importation of cherries has been large, and the extraordinary crop of strawberries has lessened the demand for cherries.

Cobs and Filberts.—These are somewhat short generally, having been injured by caterpillars in many places.

Strawberries.—There is an unusually heavy crop of this fruit, which is, as a rule, of fine quality, but prices are very low.

Red Currants.—These are a fair crop, but hardly up to the average in some parts, and are making fair prices.

Black Currants.—A better crop than last year. The mite causing "big bud" has again caused much mischief. The acreage is diminishing, as growers are afraid to plant or renew plantations on account of the mite.

Raspberries.—The wet autumn and winter did not suit the canes, many of which died off, and the crop only promises to be half or three-quarters as large as an average one.

Pears.—These are generally not a full crop; common sorts are better than those of finer quality. The strong cold east winds affected the young fruits, and great injury has been also occasioned by the Pear Midge (*Diplosis pyrivora*).

Apples are not a full crop. Some of the best sorts, such as Cox's Orange Pippin, are short; Wellington's also not plentiful. The wood was injured by the wet autumn and winter, and the attacks of the Winter Moth caterpillars, and of the Apple Sucker (*Psylla Mali*) were severe. Where growers washed the trees early and regularly the crop is by far the best.

Plums and Damsons.—These are under the average, except where the trees had been well washed. In some localities Victoria plums are a heavy crop. The trees have been infested by caterpillars and aphides.

Taking the fruit plantations of Kent all round, it would seem that the growers will at least hold their own.

Peach Leaf-Curl. (*Exoascus deformans*, Fckl.)

This disease, also known as "curl" or "leaf blister," proves very injurious to peaches and nectarines during certain seasons; almond trees are also sometimes attacked. It occurs in every part of the world wherever these trees are cultivated, but is most abundant and destructive in humid regions, although not entirely absent from districts where the air is exceptionally dry.

The leaves and young shoots are the parts attacked by the fungus; on rare occasions the blossom is also infected. Diseased leaves become fleshy, much puckered and twisted or curled, and grow to a larger size than usual; the colour is at first a pale yellowish-green, often becoming more or less tinged with rose colour; finally, the upper surface of diseased leaves becomes covered with a delicate bloom, somewhat resembling the bloom on a plum: this represents the fruit on the fungus. After the fungus has formed fruit, diseased leaves fall to the ground; this usually occurs before midsummer. Young shoots infested by the fungus become swollen and twisted or curved, and the internodes are very short; consequently the diseased leaves usually

form a tuft at the end of a stunted shoot. When a branch is once infected, the fungus continues to grow in the tissues, and passes into the new leaf-buds formed each season. The appearance or intensity of the disease, even in the case of leaf-buds

PEACH LEAF-CURL.

originating from infected shoots, depends almost entirely on prevailing climatic conditions. During a genial spring, when growth is unchecked until the leaves are full-grown, "curl" is practically absent; whereas if a cold, damp period occurs while

the leaves are young, the disease at once appears, and its rapid spread is much favoured by alternating short spells of warm and cold weather.

The injury caused by the disease consists of the dropping of the fruit at an early stage and the strain on the tree due to the growth of a second crop of leaves about midsummer, which usually remain free from disease. In the case of nursery stock, consecutive attacks for three or four seasons usually kill the tree, or stunt its growth to such an extent that it is practically valueless.

In the United States it is contended that "curl" can be held in check by spraying with a fungicide alone; unfortunately, repeated experiments have proved that this is not true for this country. In the case of diseased trees, all the terminal shoots bearing infected tufts of leaves should be removed and burned; diseased fallen leaves should also be collected and destroyed. By removing the diseased shoots one source of infection, namely, that arising from the spores formed on leaves originating from such, is removed; besides, there is no advantage in retaining such contorted twigs on the tree.

A second source of infection depends on the presence of spores that have passed the winter in the angle formed between leaf-buds and the branch on which they grow, inside the bud-scales, or in minute cracks in the bark. Such spores should be destroyed by spraying with Bordeaux mixture, commencing when the buds show the very first indication of swelling. Two sprayings, at intervals of ten days, if thoroughly well done, should suffice. The leaf-buds should not be sprayed after they begin to expand, or the foliage will be destroyed or injured.

The mixture should be made with 20 lb. of sulphate of copper and 10 lb. of lime to 100 gallons of water. The sulphate of copper must be dissolved in a vessel of cold water, and the lime, which must be pure and fresh, slaked in another vessel. The contents of the two vessels should be poured together into a tub and the proper quantity of water added. Sulphate of copper solutions are poisonous, and tubs, pails, or other vessels which have contained the mixture must not be used for other purposes.

Fungus on Fruit Trees.
(Botrytis cinerea.)

The Board have received a report of a disease attacking gooseberry bushes, which has been identified as *Botrytis cinerea*, a parasite met with on the young shoots of nearly all kinds of fruit trees, vines, &c., of which a detailed account, with coloured plate, was given in this *Journal*, Vol. X., p. 17. Where this disease attacks old wood, the tree should be dug up and burned, as the fungus is deep seated in the wood and there is no chance of recovery, whereas the danger to surrounding plants from spores developed on such diseased plants is great. Where young shoots only are attacked, all such should be cut off and promptly burned. As a check to the spread of the disease, neighbouring bushes should be sprayed at intervals of ten days with a solution of potassium sulphide—one ounce to three gallons of water. When the young shoots are forming in the spring the bushes should be sprayed again.

The "Witches' Broom" of the Silver Fir.
(Abies pectinata, D.C.)

This disease is much more prevalent in Britain than is generally suspected. It is common on the Continent, where it also attacks *Abies cephalonica*, Link ; *Abies nordmanniana*, Spach ; and *Abies pinsapo*, Boiss. In Siberia it has been observed on *Abies pichta*, Forbes ; and in North America on *Abies balsamea*, Mill.

The "witches' brooms" are caused by a fungus which has been known for a long time as *Aecidium elatinum*, Pers., and although belonging to a group of fungi where the species usually appear under very dissimilar forms, and grow on different living plants during different periods of their development, it is only quite recently that the second condition of the fungus has been detected. This discovery will greatly facilitate the suppression of the disease, which in some instances proves very destructive.

The æcidium state of the fungus attacking conifers causes two distinct forms of disease. The condition most frequent in this country consists of globose or spindle-shaped cankered swellings, often of a large size, on the trunk or main branches.

Eventually the bark is cracked and falls away at these places, and the unprotected wood also decays, forming large crater-like wounds known as *chaudrons* by French foresters. Various kinds of fungi, more especially wound-parasites, appear in these

"WITCHES' BROOM" ON SILVER FIR: WINTER CONDITION.

wounded portions, and hasten the destruction of the tree, or it is broken by wind at the cankered spot.

The second type of disease on conifers follows when inoculation of a bud takes place. This results in the formation of the peculiar arrangement of branches commonly called a "witches"

broom." These clusters grow perfectly erect from a swollen portion of the normal horizontal branch from which they originate ; the leaves produced on such diseased branches are very small, pale yellow, and only live for one season, falling in the autumn of

"WITCHES' BROOM" FUNGUS ON STITCHWORT AND ON MOUSE-EAR CHICKWEED.

each year. The fruit of the fungus is borne on these stunted leaves.

The second stage of the fungus, which has been quite recently indicated by Professor Eduard Fischer, of Berne, grows on several different kinds of small weeds belonging to the pink or

chickweed family, *Caryophyllaceae.* In this country it occurs on the following stitchworts :—*Stellaria media,* Cyrill ; *S. nemorum,* L. ; *S. graminea,* L. ; and on mouse-ear chickweed, *Cerastium semidecandrum,* L., and *B. glomeratum,* L. The important point to remember is the fact that the continuance of the disease depends entirely on the presence of both fir trees and chickweed growing within a short distance of each other, that is to say, in the same plantation.

The fungus spores produced on the silver fir cannot directly infect that plant, but give rise to the second phase of the fungus at once when sown on stitchwort or chickweed. On the other hand, the spores produced on these last-named plants give origin to a fungus when sown on the silver fir. The spores are conveyed from one plant to another by wind, birds, insects, &c. The fungus on chickweed and stitchwort forms yellowish blisters on the under surface of the leaves, from which quantities of orange-coloured spores escape at maturity.

From the above account it will be seen that the presence of stitchwort or chickweed is absolutely necessary for the development of "witches' brooms" or cankered swellings on the silver fir, hence the destruction of these weeds is imperative. The removal of the "witches' brooms" from the silver fir is also advisable, as it is the spores formed on the leaves of such that infect the chickweed and stitchwort. Spores are not formed on the cankered portions. Those desirous of following Dr. Fischer's investigations and the methods of culture adopted in demonstrating the relationship between the fungus on the silver fir and the one on chickweed, will find a detailed account in *Zeitschrift für Pflanzenkrankheiten* (1901), Vol. XI., p. 321.

A Parasite of the Bee.
(Meloe violaceus.)

A beetle recently forwarded to the Board by a correspondent has been identified as *Meloe violaceus.* There is no probability that this beetle will do any harm or increase rapidly, but it is from the view of its biology one of the most interesting of all our insects. The females lay an enormous number of eggs (five thousand times more than would be required

to continue the average number of the species), but this great fertility is necessary to make up the risks in the life history due to defective instinct. The life history of this insect is as follows:—From the egg of the beetle there comes a tiny larva. These larvæ in hundreds seek flowers that are visited by bees of different species. Having reached a flower they remain until a bee visits, when immediately the insect may be covered by hundreds of the larvæ, which cling to hairs, &c. The wild bee going to its nest may proceed to egg-laying. As the egg is being laid on the honey in the cell the *meloe* larva drops upon it (should it reach or fall on the honey it dies) and passes its first stage, devouring the contents of the bee's egg. Having devoured the egg the larva changes to its next stage, its new structure fitting it for a honey diet; and when it has attained its growth at the expense of the honey the grub passes into what is known as a pseudo-pupal stage, and later its adult condition is attained. The reason, then, for the enormous egg-laying (in some species 10,000 eggs) is that the risk is great that the right host (the special species of bee) may not be reached, and thousands of the *meloe* larvæ never reach the bee's egg on which alone they can develop, but are carried away clinging to insects not only of the same order as bees, but of widely different orders, and all useless for the completion of the *meloe* development.

Agricultural Statistics, 1903.

The complete agricultural statistics for 1903 published by the Board of Agriculture and Fisheries brings together the information collected in the agricultural returns already separately issued, and furnishes particulars of the imports and exports of agricultural produce, the prices of corn, of live stock and other commodities, together with the latest statistics relating to the agriculture of British possessions and foreign countries.

New features in the scope of the statistics now presented will be found in the ampler records of the meteorological conditions of the year, and in the tables which classify the agricultural

holdings of Great Britain, according to size, for the purpose of comparison with earlier enquiries. Tables which furnish such data as are available respecting the changes which have occurred during thirty years in the annual value of land, according to the assessments in force for income tax and rating purposes, are also given.

The growth or diminution in the several grades of holdings exceeding five acres is traced by contrasting the earlier data with the latest returns, and the number of separate "occupations" at the last three investigations shown as follows :—

YEARS.	SMALL[1] (Over 5 and not exceeding 50 acres).	MEDIUM (Over 50 and not exceeding 300 acres).	LARGE (Over 300 acres).	TOTAL HOLDINGS ABOVE 5 ACRES.
1885	232,955	144,288	19,364	396,607
1895	235,481	147,870	18,787	402,138
1903	232,892	150,055	18,081	401,028

The changes thus indicated are discussed in Major Craigie's introductory report, and attention is directed to the fact that the average size of a farm in Great Britain has slightly decreased within the past eighteen years.

The Report includes a comparison of the chief meteorological features of 1903 with those of 1879, a year of agricultural disaster, and distinguished by a very wet summer. The particulars supplied by the Meteorological Office for this comparison are given, and it is noted that the first quarter of 1879 was, in England, a good deal wetter than that of 1903, but that the reverse held good north of the Border. Both the second and third quarters were, except in Scotland, rather wetter in 1879 than in 1903. The rainfall of June, July, and August, in the earlier season, indeed, nearly reached 14 in., as against a normal supply of 8 in., while last year it was $10\frac{1}{2}$ in. The rainfall in the fourth quarter of 1879 was, however, singularly small, and, indeed, the autumn fall in 1903 was nearly three times that of the same months of 1879.

Striking an average for Great Britain, the total fall in the first nine months of these two years was practically identical : and it was the deficiency in the autumn rains of 1879 which

prevented the total recorded precipitation from being much more than $1\frac{1}{2}$ in. above the mean, whereas 1903, with an average fall of 40·6 in. throughout Great Britain, was $8\frac{1}{2}$ in. above the normal figure. The number of days on which rain fell was greater in 1903 than in 1879, but the average temperature of 1879 was practically throughout the year much lower.

[*Cd.* 2131. *Price* 2*s.* 9*d.*]

Departmental Committee on the Meteorological Office.

The Departmental Committee* appointed in 1902 to inquire as to the administration by the Meteorological Council of the Parliamentary grant, and to report whether any changes in its apportionment were desirable in the interests of meteorological science, have recently issued their report, which contains several recommendations of an administrative character, including a proposal to place the Meteorological Office under the control of the Board of Agriculture and Fisheries.

It is interesting to note that the report states that farmers residing in districts where timely information can be obtained are learning to take advantage of the weather forecasts, and although there are difficulties of distribution over wide agricultural areas where, moreover, physical conditions modify the application of forecasts, three witnesses from different agricultural districts, remote from each other, gave evidence estimating the proportion of accuracy in weather forecasts at from 70 to 90 per cent. The committee regret that no effort seems to have been made on the part of agricultural societies to co-operate in the dissemination of information of this kind.

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* *Report*, *Cd.* 2123, *Price* $2\frac{1}{2}$*d.* *Minutes of Evidence*, *Cd.* 2124, *Price* 1*s.*

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of June, 1904.

(Compiled from Reports received from the Boards Market Reporters.)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	8 4	7 7	39 3	36 10
Herefords	8 1	7 7	—	—
Shorthorns	8 1	7 5	38 5	35 11
Devons	8 1	7 7	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	$8\frac{1}{4}$	$7\frac{1}{2}$	$8\frac{3}{4}$	7
Sheep :—				
Downs	$8\frac{3}{4}$	8	10	$7\frac{3}{4}$
Longwools	$8\frac{1}{4}$	$7\frac{1}{2}$	$9\frac{3}{4}$	$7\frac{3}{4}$
Cheviots	$9\frac{1}{4}$	$8\frac{3}{4}$	$10\frac{1}{4}$	$9\frac{1}{4}$
Blackfaced	$8\frac{1}{3}$	8	$9\frac{3}{4}$	$8\frac{3}{4}$
Cross-breds	$8\frac{1}{2}$	$7\frac{3}{4}$	$10\frac{1}{4}$	$9\frac{1}{4}$
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	5 6	5 2	5 7	4 11
Porkers	6 0	5 9	6 2	5 6
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
In Milk	20 1	17 8	19 15	15 11
Calvers	19 5	16 18	19 11	15 13
Calves for Rearing	2 9	1 19	2 6	1 12
Store Cattle :—				
Shorthorns—Yearlings ...	9 3	7 19	9 15	8 1
,, Two-year-olds	13 4	11 14	14 19	12 14
,, Three-year-olds	16 0	14 18	16 9	13 15
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools—Hoggs, Hoggets, Tegs and Lambs	41 11	35 3	—	—
Scotch Half-breds ,, ...	—	—	39 2	32 9
Store Pigs :—				
Under 3 months	18 5	15 2	23 7	17 4
Over 3 months	33 4	26 11	32 3	28 7

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of June, 1904.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	57 2	54 3	56 0	53 8	56 0*	59 6*
	2nd	53 8	47 10	46 8	47 10	53 8*	53 8*
Cow and Bull ...	1st	—	46 4	46 8	46 8	45 6	44 4
	2nd	—	40 6	40 10	38 6	37 4	36 2
U.S.A. and Canadian :—							
Birkenhead killed	1st	51 4	51 7	50 2	51 4	52 6	52 6
	2nd	49 0	46 8	46 8	45 6	51 4	47 10
Argentine Frozen Hind Quarters ...	1st	31 6	33 10	33 10	32 8	31 6	31 6
American Chilled Hind Quarters ...	1st	54 10	53 8	51 4	53 8	54 10	54 10
VEAL :—							
British	1st	65 4	64 9	65 4	74 8	—	65 4
	2nd	57 2	50 7	54 10	66 6	—	—
MUTTON :—							
Scotch	1st	85 2	—	78 2	80 6	82 10	82 10
	2nd	79 4	—	72 4	70 0	70 0	64 2
English	1st	74 8	68 10	73 6	74 8	—	—
	2nd	66 6	57 9	65 4	66 6	—	—
Argentine Frozen ...	1st	36 2	36 2	35 0	33 10	35 0	36 2
LAMB :—							
British	1st	92 2	81 7	82 10	85 2	93 4	93 4
	2nd	78 2	72 11	77 0	73 6	84 0	86 4
New Zealand ...	1st	54 10	54 10	53 8	53 8	56 0	57 2
	2nd	49 0	51 4	—	51 4	53 8	53 8
Australian	1st	49 0	49 0	49 0	—	46 8	—
	2nd	—	—	—	—	—	—
PORK :—							
British	1st	52 6	53 8	—	50 2	49 0	45 6
	2nd	45 6	44 4	—	40 10	46 8	37 4

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each of the under-mentioned Weeks in 1904, and in the corresponding Weeks in 1903 and 1902.

Weeks ended (*in* 1904).	Wheat.						Barley.						Oats.					
	1902.		1903.		1904.		1902.		1903.		1904.		1902.		1903.		1904.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 2 ...	27	7	25	0	26	3	26	7	23	11	22	1	19	10	16	10	15	5
,, 9 ...	27	8	24	11	26	6	26	7	24	1	22	6	20	0	17	0	15	7
,, 16 ...	27	8	24	11	26	11	26	11	24	1	22	3	20	0	16	10	15	9
,, 23 ...	27	7	25	0	27	3	26	7	24	1	22	4	20	3	16	11	15	11
,, 30 ...	27	4	25	4	26	11	26	7	24	3	22	3	20	2	17	0	15	8
Feb. 6 ...	27	2	25	6	26	9	26	9	23	9	22	4	20	3	16	11	15	11
,, 13 ...	26	11	25	6	26	8	27	5	23	7	22	2	20	3	17	1	15	9
,, 20 ...	27	1	25	4	26	11	26	11	23	4	22	7	20	4	17	1	16	0
,, 27 ...	27	1	25	3	27	10	26	8	23	2	22	4	20	5	17	1	16	3
Mar. 5 ...	27	0	25	3	28	8	26	8	23	1	22	6	20	5	17	1	16	5
,, 12 ...	27	1	25	1	29	1	26	6	22	10	22	5	20	6	17	0	16	8
,, 19 ...	27	1	25	1	28	6	26	4	22	9	22	9	20	6	16	10	16	7
,, 26 ...	27	2	25	2	28	2	27	2	22	4	22	8	20	7	17	0	16	7
Apl. 2 ...	27	3	25	3	27	11	26	5	22	6	22	10	20	6	17	0	16	6
,, 9 ...	27	5	25	4	27	10	26	7	21	10	22	5	21	0	17	2	16	5
,, 16 ...	27	7	25	6	27	9	27	1	21	6	22	6	21	1	17	3	16	4
,, 23 ...	28	9	26	1	27	9	26	5	21	9	22	0	21	6	17	9	16	4
,, 30 ...	29	9	26	10	27	8	27	5	22	1	21	1	21	10	18	0	16	3
May 7 ...	30	9	27	6	27	4	26	10	21	10	20	8	22	6	18	2	16	7
,, 14 ...	31	1	27	9	27	1	25	3	22	5	19	10	22	5	18	4	16	6
,, 21 ...	31	6	27	10	26	9	25	4	23	7	20	4	22	6	18	5	16	7
,, 28 ...	31	6	27	8	26	9	25	1	23	7	19	8	22	10	18	5	16	7
June 4 ...	31	3	27	6	26	10	24	3	23	10	18	8	22	11	18	4	16	8
,, 11 ...	30	11	27	8	26	6	23	8	21	5	18	5	22	8	18	7	16	10
,, 18 ...	30	6	27	6	26	5	23	5	20	7	18	2	23	0	18	3	16	8
,, 25 ...	30	5	27	6	26	5	24	3	22	0	19	2	22	9	18	6	16	10
July 2 ...	30	8	27	9	26	4	25	5	20	7	18	8	22	5	18	6	17	1
,, 9 ...	30	10	28	1	26	6	24	8	19	11	19	8	22	10	18	3	17	1
,, 16 ...	30	11	28	3			23	8	20	5			22	10	18	7		
,, 23 ...	31	5	28	7			25	0	20	10			22	8	18	5		
,, 30 ...	31	8	28	11			25	0	21	0			22	10	18	6		
Aug. 6 ...	31	7	29	3			24	11	20	1			22	11	18	8		
,, 13 ...	31	7	29	11			24	9	21	3			22	2	18	10		
,, 20 ...	31	5	29	9			22	10	20	4			21	11	18	6		
,, 27 ...	31	7	30	0			26	2	22	3			21	0	18	7		
Sept. 3 ...	29	9	30	3			24	6	22	5			19	10	18	5		
,, 10 ...	27	10	28	6			27	5	22	4			19	2	17	0		
,, 17 ...	27	1	27	5			26	4	24	2			18	4	16	4		
,, 24 ...	26	6	27	0			26	4	24	0			18	0	16	2		
Oct. 1 ...	25	10	26	3			25	11	23	9			17	5	15	9		
,, 8 ...	25	5	25	10			26	2	23	8			17	2	15	6		
,, 15 ...	25	1	25	8			26	1	23	9			17	0	15	5		
,, 22 ...	24	11	25	10			26	4	23	7			17	0	15	8		
,, 29 ...	25	0	26	0			26	7	24	2			17	3	15	8		
Nov. 5 ...	25	1	26	4			26	3	24	3			17	2	15	9		
,, 12 ...	25	0	26	6			25	11	24	6			17	3	15	9		
,, 19 ...	24	11	26	9			25	6	24	3			17	2	15	10		
,, 26 ...	25	0	26	6			24	11	23	11			17	0	15	11		
Dec. 3 ...	25	1	26	8			24	4	23	9			17	0	15	9		
,, 10 ...	25	0	26	7			24	3	23	2			16	10	15	9		
,, 17 ...	24	10	26	9			24	2	23	0			16	10	15	7		
,, 24 ...	24	10	26	5			24	1	22	5			16	8	15	6		
,, 31 ...																		

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—	Wheat.		Barley.		Oats.	
	1903.	1904.	1903.	1904.	1903.	1904.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France: April ...	39 11	36 9	23 9	22 2	19 6	16 8
May ...	41 6	35 11	24 2	21 11	19 6	16 5
Paris: April ...	41 4	37 5	24 2	21 0	18 10	16 5
May ...	42 8	35 11	24 9	20 9	18 9	16 5
Belgium: April ...	27 10	30 0	22 7	21 7	17 3	15 3
May ...	28 10	30 0	22 2	21 5	17 7	15 6
Berlin: April ...	34 6	38 1	—	—	19 7	17 7
Breslau: April ...	31 9	37 6	23 4	22 3	18 1	16 3

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets*.

AVERAGE PRICES of **British Wheat, Barley** and **Oats** at certain Markets during the Month of June, 1903 and 1904.

—	Wheat.		Barley.		Oats.	
	1903.	1904.	1903.	1904.	1903.	1904.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	28 0	26 7	21 7	18 2	18 11	17 3
Norwich	27 0	27 3	21 5	20 4	17 1	16 2
Peterborough ...	26 10	24 6	20 6	18 2	17 9	15 7
Lincoln	27 6	25 6	19 2	—	18 2	16 2
Doncaster	27 2	25 7	21 5	—	18 0	16 6
Salisbury	28 5	26 3	19 10	20 7	18 5	16 11

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of June, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British	11 6	9 9	—	—	—	—	13 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	93 0	91 0	92 0	89 9	—	—	—	—
Danish ...	99 0	97 3	100 9	98 6	98 9	96 3	97 0	—
Russian ...	82 6	79 6	—	—	84 9	81 6	84 0	80 0
Australian ...	86 0	81 6	—	—	86 0	84 0	87 0	81 0
New Zealand...	88 6	84 6	—	—	90 6	88 0	89 3	81 6
CHEESE :—								
British Cheddar	75 0	70 0	—	—	72 0	68 0	63 3	58 0
			120 lb.	120 lb.	120 lb.	120 lb.		
,, Cheshire	—	—	50 4	42 9	53 3	40 3	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	47 0	42 3	42 3	40 0	41 6	39 3	46 0	42 4
BACON :—								
Irish	62 3	49 9	58 0	55 0	59 6	55 6	58 3	55 3
Canadian ...	49 6	44 6	49 9	43 9	46 6	43 6	46 6	44 6
HAMS :—								
Cumberland ...	96 0	85 4	—	—	—	—	—	—
Irish	92 0	80 0	—	—	—	—	92 0	82 0
American ...	55 0	50 9	53 3	48 6	52 0	48 9	52 0	49 1
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	9 7	8 4	—	—	—	—	—	—
Irish	9 3	7 8	7 6	6 6	7 2	6 5	7 2	6 6
Danish ...	8 10	7 6	—	—	8 11	7 11	7 9	7 2
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Main Crop ...	82 6	62 6	—	—	83 4	71 8	—	—
Up-to-Date ...	71 3	55 0	83 0	66 6	65 0	55 0	85 0	—
HAY :—								
Clover... ...	86 6	71 6	85 0	78 4	80 0	—	93 1	87 6
Meadow ...	80 0	68 6	67 9	57 1	57 6	45 0	—	—

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	JUNE.		6 MONTHS ENDED JUNE.	
	1904.	1903.	1904.	1903.
Swine-Fever :—				
Outbreaks	152	202	798	879
Swine Slaughtered as diseased or exposed to infection ..	554	947	3,863	4,191
Anthrax :—				
Outbreaks	57	61	530	429
Animals attacked	73	117	821	669
Glanders (including Farcy) :—				
Outbreaks	135	125	769	683
Animals attacked	231	217	1,387	1,135
Sheep-Scab :—				
Outbreaks	13	19	926	1,065

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	JUNE.		6 MONTHS ENDED JUNE.	
	1904.	1903.	1904.	1903.
Swine-Fever :—				
Outbreaks	26	23	74	64
Swine Slaughtered as diseased or exposed to infection ...	523	289	1,873	1,564
Anthrax :—				
Outbreaks	...	1	2	2
Animals attacked	...	1	2	3
Glanders (including Farcy) :—				
Outbreaks	1	...	5	1
Animals attacked	2	...	21	2
Sheep-Scab :—				
Outbreaks	*16	*16	*355	*380

* These figures refer to May, and to the periods ending May, respectively.

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THE JOURNAL
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AUGUST, 1904. [NEW SERIES.]

POULTRY REARING AND FATTENING IN IRELAND.

A large proportion of the table poultry produced in Ireland is consumed at home, but a still larger share is sold in the English and Scotch markets. Irish poultry-keepers, therefore, need to study closely the requirements, not only of the home, but also of the British markets if they want to hold their own against the various Colonies and foreign countries which are now supplying the British markets with fresh and frozen table poultry.

In the matter of taste for fine fowls, London leads the way, and it is the duty of poultry-keepers to study the London taste and to aim at producing an article suited to it. It is my purpose to show what the London market requires in the way of table fowls, and also to indicate what is being done amongst Irish poultry raisers to supply the demand.

Of all the fowls which are sent from various parts of the United Kingdom into London the far-famed "Surrey fowl" commands the highest price next to "capons," of which latter comparatively few are raised in these islands. An examination therefore of the Surrey fowl, as sold in London, should show what class of birds ought to be produced to meet the demand for poultry of the highest class.

Very few so-called "Surrey fowls" are raised in Surrey, the greater part of the industry of raising and fattening these fowls being carried on in the neighbouring counties of Sussex and Kent. However, all the fowls become "Surreys" when they reach London, and their distinctive qualities are: (1) large,

square body, weighing four and a-half to five and a-half pounds, (2) plump, well-turned breast, (3) white skin and flesh, (4) short white legs, (5) light coloured head and neck feathers.

The production of chickens to meet these requirements would not seem to be difficult, but only those who have tried it know how hard it is, and I have found from experience that it is almost impossible to build up an industry of this kind on new ground, which will give as good results as it does in the south-east of England, where it has been carried on for generations.

The poultry-keepers of certain parts of Ireland, however, are now engaged in strenuous efforts to produce as good fowls as the famous "Surreys," and by this means to find a way into the London and other British markets and supply some of the demand which exists for high-class table poultry.

The idea of introducing and promoting the industry of fattening fowls in Ireland for the English markets was suggested by the fact that large numbers of live chickens are annually exported from the south-eastern counties of Ireland to the fattening centres of Kent and Sussex, where they are fatted for a few weeks preparatory to being killed and placed upon the London market as "best Surrey fowls."

In 1897 the Irish Agricultural Organisation Society sent the writer over to Kent and Sussex to investigate the conditions of the chicken raising and fattening industries in these counties. The direct result of the investigation was that the Irish Agricultural Organisation Society undertook the organisation and establishment of co-operative societies for the fattening and marketing of table poultry, and advised those poultry societies which were already engaged in the egg trade, as well as the dairy and co-operative agricultural societies to include in their work a special department for the encouragement of the raising of birds specially adapted for table use. Instruction was given in the use of appliances for fattening the fowls so produced in the most approved and up-to-date manner.

It was realised that a radical change from the production of eggs to the raising of table poultry would be neither possible nor advisable, and the production of eggs was still encouraged in those counties in which few table fowls had hitherto been bred. The counties of Kilkenny, Wexford, and Waterford, with parts of

adjoining counties, had however long been famed for the number and excellence of the fowls which they raised, and these districts were selected as the most suitable localities in which to develop the fattening industry. The fowls produced in this part of Ireland had hitherto been exported to England for fattening. Irish fowls were only bought when enough could not be got at home to supply the demand, and I have it on the authority of some of the most extensive fatteners in England that the Irish fowls were not nearly so good as those raised locally, as they were wanting in uniformity, of coarse quality, and needed to be kept too long to bring them up to the desired size and weight.

It was evident to the societies that the first and most essential step to be taken was to improve the breeds. Pens of the best table breeds were procured, and in some cases contracts were made with breeders for the supply of sittings of eggs for hatching, to be distributed at cost price amongst the members of the various societies. The fowls already kept in the counties named were not pure breeds, nor even first crosses, but they had evidently been bred for many generations with a view to the production of table poultry rather than eggs, being of good size, square-bodied, full-breasted, and having, for the most part, white skin and short legs of the desired white colour. Uniformity was entirely wanting in respect of colour of plumage, shape of head, comb and wattles, number of toes, &c., but it is probable that the stock was largely founded upon Dorking, Brahma, and Cochin blood, afterwards intermingled by crossing with Plymouth Rocks, Wyandottes, and others of the newer breeds.

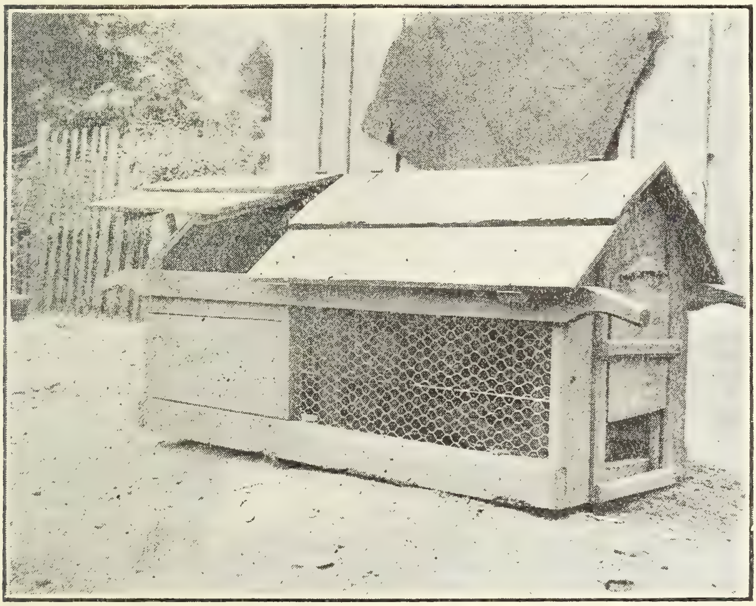
With cross-breeds and mongrels it is always difficult to secure uniformity, yet this quality is absolutely essential if poultry-keepers want to supply the best class of consumers and to realise the highest price for their produce. On the other hand, the English fatteners do not recommend the raising of pure breeds for the fattening pens, and many of them assert that such breeds as the highly-prized Indian Game and Dorking are entirely unsuited for their purpose. It seems, therefore, that the most satisfactory plan for securing the desirable quality of uniformity, and at the same time producing a class of fowl that will stand confinement and thrive well in the fattening pens, is to cross pure

bred males, such as the Dorking, Indian Game, Buff Orpington, Faverolles, or White Wyandotte with the cross-bred and mongrel hens kept by the majority of farmers. This plan has been adopted in several of the districts over which the poultry societies conduct their operations, and when the farmers have co-operated with their societies in carrying out these improvements the results have proved far more satisfactory than in cases where individual efforts at improvement have been made. A society can promote uniformity by recommending and procuring for its members male birds of a single breed, whereas if the farmers are left to select for themselves each one has his own choice, and many breeds are used, with the result that when the chickens come to be delivered to the society for marketing they are far from uniform and do not command a uniformly high price.

The breeds which are most largely used by the members of co-operative poultry societies in the south-east of Ireland are the Buff Orpington and the Faverolles, and these breeds are found most suitable for crossing with the ordinary farmyard fowls. The Dorking is also used in some cases, but yellow-legged breeds are not in favour. The English methods of rearing and fattening are now being copied to some extent in Ireland. In England the rearing and the fattening are separate industries, though dependent upon one another, and are carried on by two classes of people, namely, "the rearers" and "the fatteners." In Ireland the rearers are the farmers, labourers, artisans, &c., who keep poultry, and the fatteners are the co-operative societies. The co-operative societies are made up entirely of the farmers, labourers, and artisans, and therefore the rearers also receive all the profits of the fattening business.

The rearing of chickens is an art in itself, and can only be acquired with practice. Those who raise only a few flocks of chickens in spring have no idea of the skill required to raise chickens all the year round in the way they are reared in the table poultry districts. In order to keep the fattening centres supplied and to retain their customers they must be raised at all seasons, and to this end it is necessary for the wives and daughters of farmers and cottagers who have to do with chicken raising to study their business closely. The first essential for

successful poultry raising is to secure suitable breeding stock, and in the Irish districts to which I have referred, although the hens may be, and nearly always are, mongrels, yet care is taken to select the best of them—those which are fully matured, in robust health, well-shaped, with long, broad, and deep bodies and prominent breasts—as breeding stock, and in the selection of a male bird as much care is exercised as the average farmer uses when he buys a ram or a bull to head his flock or his herd.



PORTABLE CHICKEN COOP.

Next in importance to the careful selection of the breeding stock comes the choice of ground, houses, and appliances. The soil on most farms in the south-east of Ireland is of a nature very well adapted for chicken raising, and it is only necessary for farmers to use some discretion in choosing a field that has a southern aspect and is well sheltered. The houses recommended by the societies are of the portable wooden type, and the most successful chicken raisers now use the portable wooden chicken-coop, and rear their birds on the fields at some distance from the farmyard. The labourers still depend on their half-acre plots and on the roadsides as the only rearing grounds available.

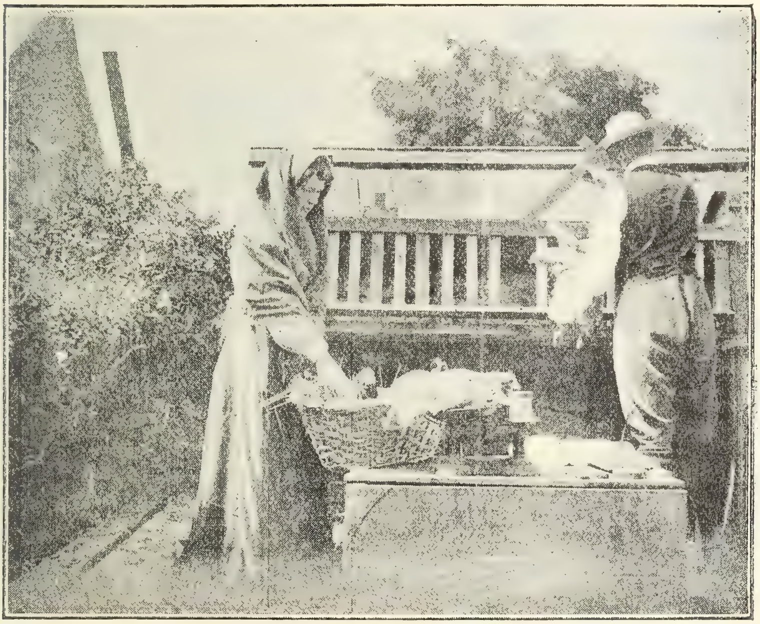
Prices run highest between January and June, and in April they are generally at a maximum, but these are the months also when it is most difficult to have chickens of the proper age and grown to the size and weight required for fattening. It is easy to see, therefore, that a good deal of intelligence, care, and skill is needed in order to reap the greatest possible profits from the chicken-raising industry.

The following description of the work of a society, which may be taken as a fair example of the average Irish poultry society engaged in the fattening and marketing of table poultry, will serve to illustrate the methods usually pursued in the south-east of Ireland in preparing table poultry for the British markets.

This society is situated in a well-wooded valley, which is the centre of one of the most flourishing table poultry industries in Ireland, and it operates over an area of about sixty square miles. The members of the society reside within this area, and consist chiefly of farmers and farm labourers, to the number of about 200. The aggregate nominal value of the share capital is about £300, made up of £1 shares, and whilst the majority of the members hold only one share each, some of those who are well-to-do hold three or four shares each. The society is governed by a committee appointed annually from amongst the members themselves, and in the election of this committee every member of the society has one vote, and only one, whether he holds one share or more than one. Meetings of the committee are held fortnightly, and during the busiest seasons sub-committees are also appointed to meet at more frequent intervals, but during the comparatively slack seasons the manager of the society conducts the business under the supervision of the general committee. In addition to the share capital there is also a further sum of £200 to £500 borrowed from one of the banking companies, and on this the society pays interest at the rate of 4 per cent. per annum. Part of the share capital has been invested in buildings and appliances, and the borrowed capital is used chiefly in conducting the business. It is necessary to have a rather large capital, as the chickens are paid for when they are delivered at the stores, and it takes three weeks to fatten them and another week before the price is received from the English merchants, so that the society must have at all

times sufficient capital in hand to carry on the business for four or five weeks.

The fattening is carried out on lines almost similar to those followed in Sussex, Kent, and Surrey. That is to say, there are two sets of coops—one outdoor and the other indoor. The outdoor coops are fixed against a wall at a height of about 4 ft. from the ground, and are made of deal boards fitting closely at the back and top, and of deal laths 2 in. wide and nailed 2 in. apart to form the bottom and front. They are 18 in. wide and



OUTDOOR FATTENING COOPS.

18 in. high, and the length of the whole range is about 100 ft. This set of coops accommodates about two hundred fowls, which are confined in lots of six, the range of coops being divided into 3 ft. lengths to hold each lot of six birds. The front of the range is fitted with sliding doors, and along the entire length there runs a small V-shaped trough, from which the fowls are fed. The fowls are confined in the outdoor coops when they arrive from the farms, and are kept there during the first period of fattening, which usually lasts about ten days. Then they are moved to the indoor coops. The latter are situated within a large airy shed,

which has been specially constructed for the purpose, and so made that it holds a single tier of coops round the four walls, with ample space in the centre for the attendant to move about and use the cramming machine.

These indoor coops are made of the same size as those described above, but the top and back are barred like the bottom and front, and by this arrangement the air is allowed to circulate more freely around the birds. There is no trough attached to the indoor coops, because the birds are fed entirely through the cramming machine. Ample indoor accommodation is also provided for another lot of 200 chickens, so that the whole fattening plant can hold conveniently about 400 birds at a time, and if the coops were kept filled throughout the year the output would be over 50,000. As a matter of fact, during 1903, 48,560 birds were despatched from these stores, and all of them passed through the cramming process.

One day per week (Monday) is fixed as a buying day, when the members of the society send in their chickens to the stores, donkeys and carts being utilised, as a rule, for their conveyance. For the convenience and information both of the society and its members the following set of rules regulating the purchase and sale of chickens has been drawn up and printed :—

1. The day for buying fowls is the Monday in every week, and no fowls will be received on any other day.

2. The hours are from 7 a.m. to 11 a.m., and from 2 p.m. to 5 p.m. on the day stated.

3. Suppliers will take their places at the front gate as they arrive, and lead their animals round in regular order, delivering the fowls as they pass the front door, and then passing round the store and out by the back gate.

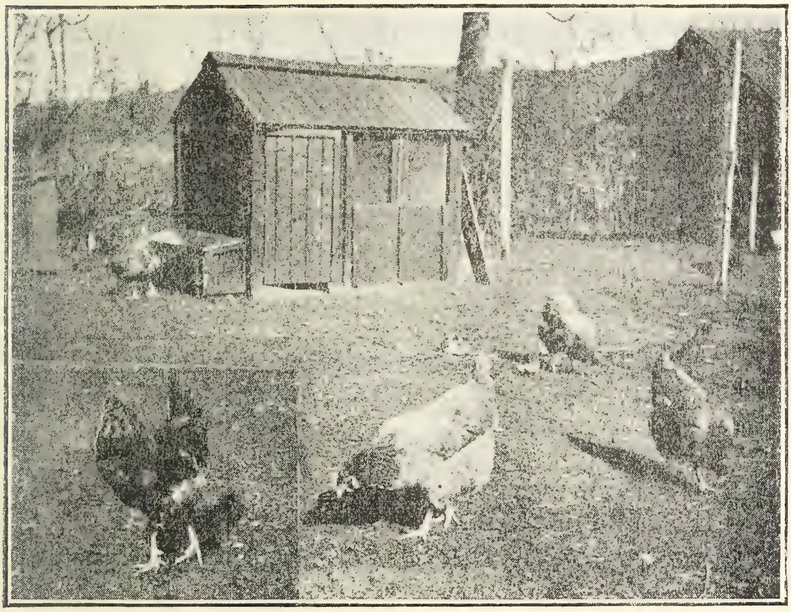
4. Chickens must be not over $4\frac{1}{2}$ months old, in good health and condition, and the manager is hereby empowered and directed to reject all chickens which appear to be over the age named, as well as those under $3\frac{1}{2}$ lb. or over $5\frac{1}{2}$ lb., and all which are scraggy, unclean, or unhealthy.

5. Chickens are bought by weight, and each supplier is requested to see that he or she gets a docket showing the weight and price of the birds, together with the price in cash. Suppliers are requested to keep these dockets in case of disputes. Should any dispute arise, it can be considered only when the dockets have been produced.

6. All birds must be fasting since the previous evening, and if any have food in their crops a deduction of 4 to 8 oz. per bird will be made, as the society cannot pay for corn at the price of meat.

As fast as the birds are purchased they are put into the outdoor pens, and some water is given them in the coops, but they are not fed until the following morning. From this time

forward they are fed twice a day—early morning and late evening—and the food consists of meal of various kinds, mixed with separated milk to form a thin, sloppy mess. The food is placed in the troughs which are attached to the front of the coops, and the chickens are allowed to eat for twenty minutes or so, until they have become satiated. Any food left over is then removed from the troughs, and they are scraped clean and washed. This treatment is continued without variation for ten or twelve days, and then the birds are moved to the indoor coops



PEN OF BUFF ORPINGTONS.

to take the place of the batch which has just been killed, and to make room for a new lot from the farms.

When confined indoors the fowls are crammed by a machine of the well-known type, and by its means semi-liquid food is pumped into the crops of fowls at the rate of about 200 per hour. Ten days of this special treatment will usually suffice to put the birds into perfect condition for killing. With regard to the foods used those most often recommended are finely ground oats and barley, with skim milk and a small proportion of fat, which latter is fed only during the last week or ten days of the fatten-

ing period. Through the courtesy of the manager of the society in question, I am enabled to give a table of figures showing the results of some experiments which have recently been made with a view to ascertaining the value of various foods for fattening :—

Coop No.	Number of Cockerels.	Weight on 1st day.		Weight on 11th day.		Weight on 21st day.		Total increase in 21 days.		Foods Used.
		lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	
1	6	24	2	28	8	32	12	8	10	Equal parts barley meal, ground oats, and fine sharps, wet with skim milk; and one ounce of fat each day per bird for last seven days.
2	6	24	6	28	8	31	6	7	0	Equal parts ground oats and Indian meal, wet with skim milk; and one ounce of fat per bird, each day for last seven days.
3	6	24	4	29	10	34	2	9	14	One part ground oats, one part Indian meal, and two parts barley meal, wet with skim milk; and one ounce of fat per day to each bird for last seven days.
4	6	24	2	27	0	30	4	6	2	Equal parts ground oats and Indian meal, wet with water; and one ounce of fat per day to each bird for last seven days.

For these trials the birds selected were of mixed breeds, such as I have described as common in the south-east of Ireland, and they were all cockerels, in good health, and as nearly as possible uniform in size and weight. It may be noted that the cockerels in coop No. 3 increased in weight by over 1½ lb. each in the twenty-one days, whilst those in coop No. 4 increased by only 1 lb. each. The difference is probably attributable mainly to the fact that the one lot had food mixed with milk, whilst the other got no milk, but had the food mixed with water. The gain in weight by coops Nos. 1 and 2 must be

considered satisfactory, and, of course, the quality of the flesh was also considerably improved, as it always is when fowls are fattened on sound, wholesome foods, such as barley-meal and milk, with meals of other kinds for variety.

As the fowls become fully "finished," which is generally after three weeks confinement in the coops, they are prepared in batches for killing. The only preparation necessary is to keep them fasting for about twenty-four hours, so that there may be no food in their crops, and the stomach and intestines may also be nearly empty.

Special days are set aside for killing and plucking, and these are the busiest days at the stores. Extra hands are engaged for these days, and it is usual to employ women and boys for plucking and stubbing. The work is begun in the early morning, when the fowls are conveyed from the fattening sheds to the killing and plucking apartment, a dozen or so at a time in a corn sack. The sack is laid on its side on the ground with the mouth open, and as the birds are very fat and tame they do not attempt to escape. The man who is engaged for killing takes them from the sack one at a time and kills them rapidly by dislocating the neck. The pluckers are seated on low forms, forming a semi-circle, so that as the fowls are plucked the feathers may accumulate in a large pile in the centre of the circle, and cannot get scattered about the room. As the birds are killed they are handed round to the pluckers, who work very rapidly. When plucked the fowls are placed on a large deal table, and they are then "stubbed" by two or three boys. Stubbing consists in taking out the pin feathers, and a short, blunt knife is used, the stub or pin feather being caught between the knife and the thumb of the operator. These boys also clean the legs and beaks of the birds, removing all traces of blood or dirt, and they singe off the hairs by holding the carcases over lighted straw. A piece of twine is next passed loosely and tied round the hocks, and the bird is then ready for the shaping board.

The fowls are placed upon shaping boards side by side in a row, with breasts turned downwards, and weights are laid on their backs to press them into a square shape. They are left in this position until the following day, for they must be quite cold before they can be packed.

Hampers are lent on hire by some of the English railway companies for the conveyance of the dead fowls from the society's stores to the markets in London and elsewhere, and these are the cheapest and most convenient form of package. The packing material used is dry, sweet-smelling oaten straw, and it is placed in layers between the birds, but sometimes the latter are wrapped in "butter paper" before they are laid on the straw.

The sale of the poultry is left entirely in the hands of the manager of the society, and he can sell all the chickens fattened at the stores, numbering nearly 50,000 per annum, at fixed net prices f.o.r. at his nearest railway station. This is the only satisfactory way of doing business, as many of our societies have had considerable losses through consigning poultry to commission agents in England, but a good salesman can always sell his fowls at fixed prices, provided they are of the right age and size, of good quality, well fattened, and neatly turned out. The secret of success in the table poultry business is strict attention to these details, and unless this fact is kept in view the result will be failure.

H. DE COURCY.

THE CHICORY INDUSTRY IN GREAT BRITAIN.

The production of chicory for mixing with coffee was formerly a rural industry of some importance in certain districts of Yorkshire and other counties of England; but during the past thirty years the home grown supply of this article has, with occasional fluctuations, gradually diminished until it has become a negligible quantity in the produce markets of this country, the requirements of which are now met almost entirely by the imports of chicory from Belgium.

Relatively to the total supply the proportion furnished by British agriculture does not now represent more than 2 per cent. of the whole, though prior to 1870 it was more than 20 per cent.,

and in earlier years it is believed to have amounted to over 50 per cent. of the quantity consumed.

The cultivation of chicory has been carried on in the villages in the neighbourhood of the city of York for a considerable period. Before 1860 the area devoted annually to the cultivation of this crop in the townships of Dunnington, Heslington, Holtby, and adjacent parishes, is said to have exceeded 1,500 acres. The drying of the roots was then undertaken by the growers in kilns on their own farms, and it is known that between 1840 and 1860 there were as many as forty-five farm kilns in operation within a short distance of York. An overseer's valuation, dated 1849, shows that eleven of these chicory kilns were situated in the township of Dunnington. Chicory was at that time grown and dried on farms not only in Yorkshire, but also on a smaller scale in Northamptonshire, Lincolnshire, and Cambridgeshire, and the industry is stated to have yielded large profits and to have given employment to a considerable number of men, women, and children.

Representations were made to the Board by Mr. Lancelot Foster, formerly Lord Mayor of York, and by several Yorkshire Agricultural Societies with regard to the decline in the growth of chicory in Yorkshire and the neighbouring counties, which, it was urged, had been accelerated by the onerous character of the Excise duties and regulations in this country and by the fact that the system of drying chicory in Belgium had enabled the imported article to escape the payment of a portion of the Customs duty and thus disturb the relations of the Excise and Customs duties to the disadvantage of the home grown product.

In view of these representations, the Board directed Mr. R. F. Crawford, who was at that time the head of their Intelligence Branch, to enquire into the circumstances under which the chicory industry is carried on in this country and in Belgium. The result of these investigations has been embodied in a Report* which has just been issued.

Chicory, it is observed, is an expensive crop to grow, owing to the large amount of labour required in the preparation of

* Report on the Cultivation and Drying of Chicory in Great Britain and Belgium. [*Cd.* 2169. *Price 2d.*]

the land and the handling of the crop. For this reason, however, its cultivation is of special interest when viewed in the light of rural depopulation.

The soil in the chicory-growing districts near York is a medium loam, the rent of which usually ranges from £2 to £3 per acre, though in some cases it is less than £2 per acre. Wages in these districts are high, the usual rates for ordinary labourers regularly engaged being 18s. a week, though occasionally as much as 21s. is given. For casual labourers engaged in digging and washing the roots the rates paid are 3s. 6d. to 6s. a day for men and 2s. to 2s. 6d. a day for women and youths.

The expenditure incurred in the production of the crop varies with the amount of labour and manure employed and with the system of rotation. From estimates furnished by farmers who have grown chicory in Yorkshire, it would appear that the gross cost of cultivation after wheat ranges from £12 8s. to £18 per acre, while after potatoes the gross outlay ranges from £9 8s. to £13 5s. per acre. It can, however, be assumed that the average gross cost of cultivation, including rent, rates, and taxes, is about £15 per acre on a corn stubble and about £4 less after potatoes, though in the latter case something must be added for the unexhausted manurial value of the farmyard manure applied to the previous potato crop.

After potatoes there would be a saving of £3 per acre in manures, and the labour bill would be less owing to the land being in better condition than is the case after wheat.

The roots are now dried at the factory, but it was formerly the practice of the growers to dry the chicory in kilns on their own premises instead of selling the raw roots to drying merchants, but the necessity of conforming to the Excise regulations discouraged growers from utilising the farm-kilns, which were gradually abandoned after 1861. At the present time the quantity of roots produced on separate farms is so small that it would not be profitable for an individual grower to dry his own produce unless he could combine with other growers in the maintenance of a common kiln.

The closing of the country kilns has undoubtedly led to a

diminution of the profits formerly earned by the grower of chicory, inasmuch as he is now unable to reap any advantage from a rise in the price of the dried product, since the roots must be sold for drying as soon as they are harvested, and the price offered for them is naturally fixed by the drier at the lowest possible figure. It is important, therefore, that the growers should be encouraged to re-open the country kilns if any steps are taken to revive the chicory industry in this country.

The Report contains an interesting account of the Belgian chicory industry, and a comparison is made of the conditions affecting the industry in England and Belgium. There is, it appears, little difference between the English and Belgian methods of cultivating chicory, but there are certain differences in the methods of collecting and assessing the Excise and Customs duties on chicory in this country which operate to the disadvantage of the home industry. Mr. Crawford draws attention to these differences in the incidence of the duties on the home grown and imported product, and observes that so long as these are allowed to continue there is not much prospect of a successful revival of the chicory industry. If, however, the readjustments in the methods of charging the Excise and Customs duties suggested in this Report are carried out, an important step will have been taken towards the restoration of the industry in this country.*

THE AGRICULTURAL POPULATION.

The decennial enquiries which have been held since 1801 into the numbers and occupations of the people have distinguished, in one form or another, the proportion of the population chiefly engaged in agriculture. In the earliest Census the number of persons so occupied was returned, but in the three

* In reply to a Question in the House of Commons, the Chancellor of the Exchequer stated on 10th August last, that any alteration in the rates of duty would require legislation.

succeeding enquiries the number of families, not individuals, was ascertained. The defects of this classification, however, became evident, and in 1831 it was supplemented by a table showing separately the owners of land and farm labourers over 20 years of age. In 1841 the method of taking the Census by persons instead of by families was reverted to, and in 1851 the important innovation of grouping the occupations in classes was introduced, and the broad definition under which persons following agricultural occupations were grouped is given in the Census Report for 1861 as (*a*) persons possessing or working the land and engaged in growing grains, fruits, grasses, animals and other products ; and (*b*) persons engaged about animals. Since that date many modifications have been made, though it may be said that the general characteristics of the group have on the whole been preserved.

Numerous changes in classification were introduced in 1901 by the Registrar-General at the suggestion of the Board of Agriculture, and with a view to securing greater accuracy in the returns the Board issued a memorandum to agriculturists urging them " in view of the importance of all questions relating to the number and distribution of the agricultural population, to render their best assistance to ensure that the particulars entered on the Census Schedules by farmers and farm labourers are precise and specific and capable of accurate arrangement in the groups to which they respectively belong." It is believed that a considerable improvement in the returns has been thus effected, though the value of the figures for purposes of comparison has necessarily been to some extent impaired.

Before proceeding to deal with the figures for 1901 which are given in the General Report of the Census of England and Wales, reference may perhaps be made to the fact that the figures represent persons who derive their living mainly from the pursuit of agriculture, but they afford only a partial indication of the extent to which the land gives employment to the people, as they do not show in how many instances agriculture forms a secondary occupation.

Notwithstanding the continuous decline which has taken place in the rural population, the agricultural industry when judged by the numbers engaged in it, still remains the most

important industry in the United Kingdom. The classification adopted throughout the kingdom is not identical, and the modifications which have been introduced in Great Britain in successive years interfere with exact comparison, but the following figures represent approximately the number of persons (male and female) aged 10 years and upwards, engaged in agriculture in 1881, 1891 and 1901 :—

	1881.	1891.	1901.
England and Wales ...	1,352,544	1,285,146	1,197,922
Scotland	240,131	213,060	205,007
Ireland	981,356	922,720	859,525
United Kingdom ...	2,574,031	2,420,926	2,262,454

In addition, the majority of the general labourers in Ireland may, it is stated, be assumed to be agricultural labourers, and these numbered 144,000 in 1881, 119,000 in 1891, and 118,000 in 1901.

The proportion borne by males engaged in agriculture to the total male population of the United Kingdom aged 10 years and upwards, which had been 188 per 1,000 in 1881, fell to 162 per 1,000 in 1891 and further fell to 136 per 1,000 in 1901. Taking England and Wales alone, the numbers were 138 per 1,000 in 1881, 117 per 1,000 in 1891 and 96 per 1,000 in 1901. In Scotland a serious decline is also shown, the proportions at the three Censuses being 144, 127, and 107 respectively. In Ireland, however, where over two-fifths of the male population aged 10 years and upwards are agriculturists, the proportional decline was far less, the rates per 1,000 being 460 in 1881, 457 in 1891, and 443 in 1901.

Taking the United Kingdom as a whole, the loss of workers in this industry, which amounts to a quarter of a million in the course of twenty years, may be taken as indicating a continuous agricultural depression.

Turning to the figures for England and Wales, the returns for 1901 show that there were employed in agriculture on farms, woods, and gardens, according to the classification of the eleventh Census, 1,128,604 persons, all but 57,564 of whom were males. In the following table, which shows the figures since

1851, the numbers have, as far as possible, been rendered comparable :—

Year.	Males Engaged in Agriculture.	Percentage of Total Males Aged 10 Years and Upwards.	Females Engaged in Agriculture.	Percentage of Total Females Aged 10 Years and Upwards.
1851 ...	1,544,087	23·5	168,652	2·4
1861 ...	1,539,965	21·2	115,213	1·5
1871 ...	1,371,304	16·8	85,667	1·0
1881 ...	1,288,173	13·8	64,216	·6
1891 ...	1,233,936	11·6	51,045	·4
1901 ...	1,153,185	9·5	38,982	·3

The above summary shows that the numbers of both sexes engaged in agricultural pursuits have declined continuously throughout the last half century. During the last ten years the males have decreased from 1,233,936 to 1,153,185, or by 6·5 per cent., following on a decrease of 4·2 per cent. between 1881 and 1891 ; and the females have declined from 51,045 to 38,982, or 23·6 per cent., following on a decrease of 20·5 per cent. in the preceding intercensal period. This decline in the numbers is illustrated in the report by a table extracted from the returns of this Department, showing the large amount of arable land, viz., 780,000 acres, which has ceased to be cultivated as arable during the past ten years.

The number of persons returned in 1891 as farmers or graziers was 223,610, or 333 less than the number in 1881. At the recent Census the number so classified was 224,299. The figures for 1901 include fruit, hop, and potato growers, and poultry farmers, who were formerly classed under other headings. Probably, if the number of these in 1891 could be added to the figures for that Census, the heading would show a decrease in 1901. The figures returned since 1851 indicate, however, that the number of holders of farms has not materially declined during the half-century, but as the report of the Census proceeds to show, the same cannot be said with regard to the workers on the farms. The total number of such workers, including farmers' male relatives assisting in the work of the farm, bailiffs, foremen, shepherds, agricultural labourers, and farm servants at each of the last six Censuses, is shown in the

following table. Farmers' sons under 15 years of age are excluded, as they were not generally classed as occupied prior to 1901. The female relatives of farmers returned as assisting in the work of the farm, which were not shown in 1891, are also omitted. Farmers' wives also assist in farm work, but their numbers have not been ascertained.

	Males.	Females.
1851	1,232,576 ...	143,475
1861	1,206,280 ...	90,525
1871	1,014,428 ...	58,656
1881	924,871 ...	40,346
1891	841,884 ...	24,150
1901	715,138 ...	12,002

These figures illustrate clearly the rapidity with which, during the last half-century, agricultural labour in England and Wales has declined. In 1851, of every 100 males over 10 years of age, 19 were workers on farms, whilst in 1901 the proportion was only 6 per 100. In the course of fifty years the number so engaged has declined 42 per cent. Between 1881 and 1891 the decline was 9 per cent., and between 1891 and 1901 it was 15 per cent. In all the English and Welsh counties more or less decline has taken place, but it is a striking fact that with the exception of Cornwall and Dorset the decline in all the counties south of a line drawn from the Wash to the Severn has exceeded 15 per cent. The reduction in female agricultural labour has been even more remarkable.

The decrease in the number of agricultural labourers and farm servants has undoubtedly been partially compensated by the more general adoption of machinery by the farmers themselves, and in addition to this there is a small class of agricultural machine proprietors and attendants, whose number, though small, has increased during the last decennium by 40 per cent., viz., from 4,675 to 6,545. Of these, 694 were enumerated in Lincolnshire, 469 in Suffolk, 449 in Essex, 409 in Norfolk, and 317 in Cambridgeshire, a total of 2,338 in this group of eastern counties against a total of only 937 in the northern counties down to and including those of York, Lancaster, and Chester, and the entire Principality of Wales.

In contrast with the decrease in the number of workers on farms is the considerable increase in the group consisting of

Z 2

nurserymen, seedsmen, florists and gardeners (with whom for comparative purposes 87,936 domestic gardeners must be included). In the aggregate this group numbered 216,165, compared with 179,336 in 1891, an increase of 20½ per cent.

The number of woodmen enumerated was 12,035, having increased since the preceding decennium by 27·4 per cent.

In order to complete this summary it may be useful to give the numbers returned in England and Wales under the various occupations at each of the past three Censuses. It is advisable, however, for purposes of comparison, to amalgamate headings 2, 3, 4 and 5, but excluding from No. 2 all the females and males under 15 years. This is done in the comparative table previously given.

Description of Occupation.	Males.			Females.		
	1881.	1891.	1901.	1881.	1891.	1901.
1. Farmers, graziers	203,329	201,918	202,751	20,614	21,692	21,548
2. Farmers', graziers' sons, daughters, or other relatives assisting in the work of the farm (so returned) ...	75,197	67,287	89,165	—	—	18,618
3. Farm bailiffs, foremen	19,377	18,205	22,623	—	—	39
4. Shepherds ...	22,844	21,573	25,354	—	—	12
5. Agricultural labourers, farm servants—						
(a) In charge of cattle ...			81,302			3,797
(b) In charge of horses ...	807,608	734,984	154,377	40,346	24,150	5
(c) Not otherwise distinguished			348,072			8,149
6. Woodmen ...	8,151	9,448	12,034	—	—	1
7. (a) Domestic gardeners			87,900			36
(b) Gardeners (not domestic) nurserymen, seedsmen, florists ...	145,142	174,290	123,125	3,143	5,046	5,104
8. Agricultural machine—Proprietors, attendants	4,222	4,608	6,480	38	67	65
9. Others engaged in or connected with agriculture ...	2,458	1,788	5,757	75	90	226

Imports of Maize from Roumania.

In consequence of the severity of the drought in that country, the export of maize from Roumania was prohibited by a Royal Decree, dated 1st August, 1904; but contracts made prior to that date may with the consent of the Minister of Finance be carried out provided papers relating to them were deposited before the 4th August.

The contribution of Roumania to this country's supply of maize in the past five years has been as follows:—

	Millions of cwts.	
	Total Import.	Import from Roumania.
1899	62·7	7·4
1900	54·2	2·3
1901	51·4	10·0
1902	44·5	18·6
1903	50·1	4·2

In the first seven months of the present year the receipts from Roumania have amounted to 4 million cwts., or nearly as much as last year's supply. The immediate effect of the prohibition, if other sources of supply hold out, may not therefore be great.

Crops in Russia.

The condition of the crops in South-West Russia is stated to be the reverse of favourable. In the Government of Kherson the state of the crops is reported as unsatisfactory, and in parts extremely bad. In the greater part of the Crimea and in Southern Bessarabia, spring wheat is in an unsatisfactory condition. In the district of Bolgrad the whole crop is lost. The harvest has begun, but has been interfered with by heavy rains.

According to the statement published officially relative to the prospects of the crops in the whole of Russia the outlook in general is not a bad one. Winter wheat is fairly good, with the exception of the crop in South-West Russia and in the Smolensk district. Spring wheat is stated to be very good in South and East Russia; rye, oats, and barley are above the average.

In Poland, H.M. Consul-General reports that the cold weather and the drought which prevailed through May and June had a very bad effect on crops of all kinds. Winter cereals were so

dried up that the sudden heat which came at the beginning of July ripened them off, and harvesting had already begun by the middle of July. The wheat crop is expected to be 5 to 10 per cent. below the normal yield.

Crops in Hungary.

The preliminary estimates of the crops in Hungary (excluding Croatia and Slavonia), dated the 15th July, have been published by the Hungarian Ministry of Agriculture. The yield of wheat is put at 127,911,000 bushels, compared with 161,909,000 bushels last year, or a decrease of 21 per cent. The quality in very many districts, and even generally, is said to be satisfactory. The crop of barley is 45,649,000 bushels, against 61,976,000 bushels in 1903. This crop has suffered considerably from the excessive heat and the prolonged drought, and unfavourable reports as to quality have been received from many districts. The yield of oats is also unfavourable both as regards quantity and quality, the preliminary figures placing the production at 50,594,800 bushels, compared with 71,636,000 bushels last year.

Crops in France.

The Report of the French Ministry of Agriculture on the current year's crops shows that the condition on the 1st of July was generally less favourable than at the date of the previous Report, viz., the 15th of May. Winter wheat was returned as "good" in 28 departments, "fairly good" in 49 departments, while 8 departments gave less favourable reports. Spring wheat was returned as "good" in 22, and "fairly good" in 27 departments. Potatoes showed an improvement, the condition in 3 departments being returned as "very good," in 53 as "good," in 24 as "fairly good," in 5 as "passable," and in 1 as indifferent.

The area under the principal crops was given in the last number of this *Journal*, p. 210.

Crops in United States.

The preliminary returns of the United States Department of Agriculture, dated 1st July, showed that the acreage of maize planted was about 91,930,000 acres, an increase of 2,130,000 acres or 2·4 per cent. on the area planted last year. The average condition of the growing crop was 86·4 as compared with 79·4 on 1st July, 1903. The condition of both winter and spring wheat, the acreage of which was given in last month's *Journal*, somewhat improved during June, and the condition at the beginning of July was 84·5, compared with 80 on the same date in 1903. The oat crop also showed some improvement, but the barley crop lost 2 points. The acreage of potatoes was greater than last year by 3·4 per cent.

Vitality of Seeds.

The effect of bad weather on the vitality of seed was the subject of a note in the previous number of this *Journal* (Vol. XI., p. 217), and some information on the point raised therein is given in a bulletin which has recently been issued by the United States Department of Agriculture.

This bulletin deals with the conditions influencing the vitality and germination of seeds when subjected to such methods of treatment as are generally met with in the seed trade. A very important part of the investigations was directed to considering the effect of climatic conditions. It was known that the rapidity with which seeds lost their vitality, when stored under ordinary conditions, varied greatly with the section of the United States in which the seeds were kept. This loss of vitality was especially marked in the case of seeds stored in places of relatively high humidity. A number of experiments were carried out with a view of testing this, and it was quite evident that moisture played an important part in bringing about the premature death of seeds, and that the detrimental action of moisture became more marked as the temperature increased.

Thus at Mobile, Alabama, where the annual rainfall was 91 inches and the mean temperature 71 degrees F., there was an average loss of vitality in thirteen samples of 72 per cent.;

whilst in Michigan, where the rainfall was only 28½ inches and the mean temperature 49 degrees F. the loss of vitality only amounted to 2½ per cent. Figures tending to support this conclusion are also given for other places; though the comparisons were found to be somewhat indefinite. If the rainfall had been equally distributed throughout the year a definite ratio could, it is thought, have been established, but in the majority of the places where the experiments were made there were alternating wet and dry seasons, which made the comparisons very difficult and unsatisfactory. The evidence obtained, however, seemed to show quite clearly that seeds retain their vitality much better in places having a small rainfall. It was also found experimentally that most seeds if kept in a dry atmosphere were not injured by prolonged exposure to temperatures below 98½ degrees F., but if the temperature was increased above that point the vitality was seriously reduced, and long exposures to a temperature from 102 degrees to 104 degrees F. were found to cause premature death; if the seeds were kept in a moist atmosphere, a temperature as high as 86 degrees F. was found to cause much injury in a comparatively short period. In this connection it must be remembered that grain, first stored in stacks and afterwards used for seed, may have been exposed to a much higher temperature than the surrounding air when in the interior of the rick.

The curing of seeds is of the utmost importance, and great care should be taken to prevent excessive heating, otherwise the vitality will be greatly lowered. When seeds come to be stored the main factor to be considered is dryness, and they should be put in well ventilated rooms kept dry by artificial heat. This method of treatment requires that the seeds be well cured and well dried before storing, but in no case must the temperature of the storehouse be increased unless the seed is amply ventilated, so that the moisture from the seed can be carried off readily by the currents of air. If this precaution is not taken the increased humidity of the air confined between the seeds will cause a marked injury. For this reason seeds kept at low temperature during the winter deteriorate in the warm weather of spring, especially if they contain much moisture.

The bulletin, which contains an account of the various

experiments which have been carried out, concludes with the observation that the life of a seed is undoubtedly dependent on many factors, but the one important factor governing the longevity of good seed is *dryness*.

In the case of the Aberdeenshire experiments the relationship between the duration of exposure to moisture or bad weather and the vitality of the seed was shown by the fact that samples of seed in the stook for three weeks in rainy and misty weather germinated 40 per cent., after four weeks in the stook the germination was only 33 per cent., and after five or six weeks it fell to 29 per cent. The American bulletin also observes generally that seed harvested in damp, rainy weather is much weaker in vitality than seed harvested under more favourable conditions. This seems supported by the fact that seeds from oats grown in Aberdeenshire germinated 63 to 73 per cent., while seed from the same variety grown in Cambridgeshire, one of the dryest districts in England, germinated 91 to 92 per cent.

Canadian Seed Growers' Association.

A meeting was held at Ottawa in June last for the purpose of establishing the Canadian Seed Growers' Association. The object of this association is to encourage the general use of improved seed, with a view of improving the yield and quality of the field crops of Canada. It is a voluntary organisation, but the President is to be appointed by the Minister of Agriculture, and the Chief of the Seed Division of the Department is to act as Secretary. The association proposes to promote the interests of seed growers and farmers by making regulations respecting the growth, selection, and preservation of seeds for the guidance of its members; by causing records to be kept of seeds produced; by fixing standards for seeds eligible for registration; and by issuing certificates of registration to members by which selected seeds or their product may be known.

In this connection the Canadian *Farmers' Advocate* observes that there is an opportunity in every agricultural locality in Canada for a few farmers to make a speciality of growing high-

class seed as distinguished from the growth of grain for food, and the purpose of the association is to bring these farmers into an organisation which will instruct them in the best means of improving their seed, and also educate buyers and farmers generally in the value of high-class registered seed. Reference is made to the fact that in the maize-growing States of Western America associations of seed-corn growers have been organised for the purpose of ensuring supplies of seed, improved not only in yield but also in quality, particularly in the content of protein.

The sale of seeds in Canada is not at present subject to any Government control, but the attention of the Department of Agriculture has been directed to certain abuses in the seed trade, with the result that a Bill, which is now before the Legislature, has been drafted providing for the inspection and sale of seeds. One object of this Bill is the prevention of the dissemination of noxious weeds, and a handy collection of economic seeds has been prepared by the Department for the use of seed merchants and agricultural institutions as a means of assisting in the identification of seeds of useful and noxious plants. These collections contain authentic specimens of 100 species, put up in small bottles and suitably labelled, and are supplied to seed merchants for two dollars. The Bill also proposes to establish uniform terms for the grading of the more important grass and clover seeds according to fixed standards of purity and vitality.

The Hessian Fly. (*Cecidomyia destructor.*)

The Board have received a report that an attack of the Hessian fly has been observed in the neighbourhood of Box, Chippenham. Although this fly is occasionally met with, it has not in recent years been the cause of any very serious damage; but in 1886 and 1887 the insect became somewhat widely distributed throughout Great Britain, twenty counties in England and ten in Scotland being attacked.

In view of its destructive character in America, Canada, and some parts of Europe, the Agricultural Department of the

Privy Council took special steps to ensure the wide distribution of information respecting the pest, and of advice as to modes of prevention and remedies. The weather of the two following years, which was cold and wet, was unfavourable to the development of the insect, and the infestation appears to have been rapidly checked.

The Hessian fly, a dark-coloured fly or midge, measuring only one-eighth of an inch in length, lays its eggs in May and June on wheat and barley, often just above the second joint or knot on the stem, but sometimes lower down, or it may be a little higher up. The legless maggots, which hatch in a few days, live between the leaf sheath and the stem of the plant, and so weaken the stem by their feeding that the stem becomes elbowed, bending over just above the place of larval feeding. A month or more, according to climatic conditions, may be passed in the larval stage, and then pupation takes place under cover of a case resembling in shape and size a small flax-seed. There may be an issue of adult flies from these in the same year, but in Britain the issue to be feared is that of the next year, at the end of April or in May. The plants attacked include wheat, barley, and rye. Couch grass and timothy are also subject to infestation, and the possibility of these acting as breeding-places should be noted.

When the crop is harvested, from the position of the infestation on the stem, many of the " flax-seed " or pupa cases will be left in the stubble. Burning the stubble, or ploughing it in so deeply that flies from the buried pupa cases will be unable to reach the surface, should be carried out where practicable. All screenings and " flax-seeds " that fall away in threshing should be burnt.

The grain of plants that have been attacked should not be used for seed. The value of the grain depends to a great extent on the reserve material passed into the seed during ripening, and the plants stunted and weakened by attack will naturally have poorer seed.

Fertilisers, especially in the case of a mild infestation, would prove useful in aiding the plant to tide over attack. Stout, coarse-stemmed varieties of wheat and barley should be grown as less likely to elbow.

Clover following wheat is quite safe, as Hessian fly does not

attack clover; but flies from the "flax-seeds" in the stubble may pass in a favourable season the following year to other wheat plants; and, in order to prevent such possible spread, the cereal crop might be sown without "seeds," so that the stubble could be ploughed in as burnt.

In the case of infestation at the present time, the winter wheat should be put in as late as possible, so as to avoid a possible attack by flies that might issue this autumn.

Potato Disease.

Potato disease* (*Phytophthora infestans*) is practically wholly propagated and carried on from season to season in the sets themselves; it is therefore of the first importance that seed should not be saved from diseased fields, and that it should be stored under the most favourable conditions. In the ordinary way seed potatoes should be carefully picked over and all that show the least sign of taint rejected; they should be allowed to get thoroughly dry before clamping and should be stored separately. Any diseased haulm should be removed and burnt before the potatoes are lifted.

It is observed that varieties of potato that have been long in cultivation contract the disease more easily than many of the newer sorts. Farmers, therefore, find that it is advantageous occasionally to obtain a new or more resistant variety. Experienced potato growers usually change their "seed" rather frequently, and, as a rule, it is found that the best results follow a change of seed from a poor to a good district.

Very frequently, only a single plant in a patch of potatoes is at first affected by the disease, and its prompt removal and the burning of the diseased parts may prevent an epidemic.

The rows of potatoes should be well "earthed" or "banked" up, as the thicker the layer of soil the less chance is there of the spores of the fungus reaching the young tubers. A mixture of equal parts of powdered quicklime and sulphur sprinkled on the surface of the soil destroys all spores that come in

* A description of this disease is given in Leaflet No. 23.

contact with it. This remedy is of especial value where potatoes are grown under glass.

Neither disease-resisting varieties nor cultivation can be trusted entirely to ward off the disease in a wet season, but spraying with various preparations of copper has been found effective and is now part of the regular routine of cultivation in humid districts like the West of Ireland. Even in dry seasons when no disease is apparent the treatment is found to be beneficial, producing a longer period of growth and an increased yield. This is so generally recognised that spraying has become usual in the potato-growing districts of the Lothians, whatever the season promises to be. As the disease does not, as a rule, make much headway before the end of July, spraying is not wanted for the first and second early sorts whose leaves will be dying down before any great harm is done. The principle of the spraying is to coat the leaves with a very slightly soluble compound of copper, the hydrate or the hydrated carbonate. This will just dissolve sufficiently to act as a fungicide without injuring the plant, and at the same time it will not be removed as any more soluble substance would be by the first shower of rain.

The ordinary Bordeaux mixture should be made as follows:—

Sulphate of copper (bluestone)	12 lb.
Quicklime	6 lb.
Water	100 gals.

In purchasing the sulphate of copper care should be taken to demand a product of 98 per cent. purity; material offered as "agricultural" sulphate of copper should be avoided.

The usual adulterant of sulphate of copper is sulphate of iron, which is much cheaper, but entirely ineffective for the present purpose. An easy test for the presence of iron in the sulphate of copper is to dissolve a little in water and add ammonia with constant stirring until a deep blue liquid forms; any quantity of brown flocks floating about in this blue liquid indicates the presence of so much iron that the material should be subjected to a proper chemical analysis.

The sulphate of copper should be dissolved in the bulk of the water; but, if it is thrown in lumps into the bottom of the vessel it will take a long time to dissolve. Some people

powder it (or it can be purchased in powder) and make the solution by stirring it up with a small quantity of hot water, but the easiest way is to tie the sulphate of copper in a piece of canvas and hang it near the top of the water from a stick across the mouth of the vessel. The vessel in which the copper sulphate is dissolved must be of earthenware or wood, a paraffin cask is useful for the purpose, but galvanised iron would be attacked by the solution.

The lime is to be slaked in another vessel (an ordinary galvanised pail will do), made up into a thin cream with water, and then poured through a sieve or a piece of sacking into the solution of copper sulphate. Now add the rest of the water and stir well up.

It is essential to have sufficient lime present to precipitate the whole of the copper; if any remains dissolved it will burn the foliage. Secure freshly burnt lime, and, if possible, obtain white "fat" lime made from mountain limestone or chalk, the kind of lime which is used by plasterers. If only gritty "thin" limes can be obtained it is better to follow one of the other recipes without lime. In any case it is wise to test the mixture to see there is no copper sulphate present. To do this, obtain from the chemist at the same time as the sulphate of copper an ounce of potassium sulphocyanide. Allow the lime and copper mixture to settle a little and dip out some of the perfectly clear liquid at the top in a teacup; into this drop one crystal of the sulphocyanide and stir up with a clean stick or spoon. If any copper be present a deep chocolate-red colour will result, which means that more milk of lime must be added to the mixture.

The mixture should be well stirred up before it is poured into the sprayer, which should have a dasher of some kind to stir the material during spraying. The mixture will keep several days, but the longer it remains unused the more difficult it is to distribute it properly with the sprayer.

As the ordinary Bordeaux mixture is easily washed off there is an advantage in adding some sticky substance, especially in showery weather. Treacle is perhaps the best, but it is very little good to add treacle directly to the mixture previously described. A better preparation is to take a little more lime,

10 lb. for the 12 lb. of copper, slake it, and mix with hot water, then run in 10 lb. of agricultural treacle (any cheap sugar will do if only small lots are being made), stir up well, heating, if possible, until the lime and treacle have combined, then pour the mixture into the copper sulphate solution as before. This time a green solution of copper saccharate will be obtained, but by the action of the air it will precipitate copper carbonate, which will not be washed off by rain at all readily. This mixture is very effective, but must be used very soon after making up.

Bordeaux mixture with soda instead of lime may be made as follows :—

Copper sulphate or bluestone	12 lb.
Washing soda or soda crystals...	15 lb.
Water	100 gals.

Follow the instructions given above, using the solution of washing soda instead of the lime and water.

Another mixture which may be used is "Cupram":—

Copper carbonate	10 oz.
Ammonia (*Liquor Ammoniæ fortiss.* ·880)	5 pints.
Water	100 gals.

Add the ammonia to four or five gallons of water, and throw in the copper carbonate little by little, stirring vigorously until dissolved. Then dilute with the rest of the water. A clear blue solution results, which is advantageous in never clogging the nozzles of the sprayer. This mixture can be made up and kept in the concentrated form until required for use. It is particularly suited to fruit trees and work under glass.

The strength of any of the above mixtures can be varied; up to 20 lb. of copper sulphate, with a proportional amount of lime, may be used for 100 gallons of water, but a mixture of this strength should only be used on mature plants with fully-developed leaves.

Sulphate of copper compositions are poisonous, and the tubs, pails, or other vessels which have contained Bordeaux mixture, or in which it has been made, must, therefore, not be used for farm animals.

Dry powders containing the copper and lime products are sometimes dusted on to the leaves, but it is more difficult to secure adhesion, and the method is more wasteful of copper.

The quantity to be applied per acre is about 120–150 gallons where the foliage is fully developed ; it might be somewhat less in the earlier stages of growth. The plants should be sprayed from underneath, as well as from above, so as to reach the fungus on the under sides of the leaves. Machines can be obtained which spray the plants from below, or which, in other ways, secure that the solution shall reach the lower side of the leaves.

The cost of a single spraying need not exceed 8s. per acre, and, with certain horse machines, 30 acres can easily be treated in a day. The operation should be done before any symptoms of disease show themselves, say towards the end of June or early in July, according to the locality and season. The first spraying should be as soon as there is a good development of haulm, the treatment being repeated about three weeks later, when the growth is complete. If only one spraying is given it should take place about the middle of July. Early blight (leaf curl), which comes in dry seasons when the plant is only a few inches high, should be treated in the same way.

Plant-Lice on Mangolds.

Complaints have recently reached the Board of considerable damage to the mangold crop due to the attack of a small black aphis or plant-louse, which lives in colonies on the underside of the leaves. Where a spraying-machine is available the crop should be treated with one of the approved washes in use against green-fly, care being taken that the spray is directed upwards, so that it reaches the underside of the leaves. A suitable wash consists of 8 lb. of soft soap in 100 gallons of soft water. To this should be added the extract got by boiling 6 lb. of quassia chips in 2 gallons of water. Instead of the quassia, $1\frac{1}{2}$ gallons of paraffin may be added to the 100 gallons of soap wash, care being taken to thoroughly incorporate it by means of vigorous stirring. These quantities will suffice for one acre, though more may be applied in the case of a bad attack.

Egyptian and Indian Cotton-seed-Cake.

The attention of the Board has been drawn by Dr. J. Augustus Voelcker to the growing practice of manufacturing cake made from mixed Indian and Egyptian cotton seed, and invoicing and selling the product as Egyptian cotton-cake. There is a difference of from 10s. to £1 per ton in the prices of cotton-cakes made from the two classes of seed, and it is clear misrepresentation and fraud to sell as Egyptian cotton-cake what is really made from a mixture of the two kinds. It is also unfair to those manufacturers who make and guarantee genuine Egyptian cotton-cake, as they obviously cannot compete fairly with mixed seed sold at a lower price.

Farmers are advised, therefore, to have their cake sampled and analysed by the District Agricultural Analyst in the manner prescribed by the Fertilisers and Feeding Stuffs Regulations, 1897.* In many counties the County Councils have appointed authorised representatives of the District Analyst to take samples either free or at a very small fee.

With regard to the comparative value of undecorticated cotton-cake made from Indian and Egyptian seed, a Report† made to the Indian Department of Agriculture by Professor Gilchrist, of the Durham College of Science, is of interest.

Trials were made during the summer of 1902 at the Northumberland County Council Farm at Cockle Park on the effects of feeding two kinds of undecorticated cotton-cake to cattle and to sheep while feeding on pasture. The two cakes were:—(*a*) Egyptian undecorticated cotton-cake, costing (at station) £5 1s. 3d. a ton.; (*b*) Bombay undecorticated cotton-cake, costing (at station) £3 10s. a ton.

The latter cake is less palatable and contains more woolly fibre, but each of the cakes was good for its class.

The results were distinctly in favour of the Bombay cake when the price‡ is taken into account, and indicate that a good cake of this class can be profitably fed to stock. So far there is no reason to suppose that the harder and more woolly

* Reprinted in Leaflet No. 18.

† The Agricultural Ledger, 1903, No. 9.

‡ The relative prices of undecorticated Egyptian and Indian cotton-seed-cakes in July, 1903, were, at Hull, £3 7s. 6d. and £2 17s. 6d. per ton.

Bombay cake had any injurious effects on the animals to which it was fed, but this can only be satisfactorily ascertained by a trial covering a considerably longer period. The results, whilst satisfactory as to the Bombay cake, must therefore be considered as of a tentative character.

The following tables give the results of feeding each of the cakes to cattle and to sheep for two successive periods of one month (four weeks) each :—

—	Increase in Live Weight of each Animal per Week.	
	Egyptian Cake.	Bombay Cake.
First Month.	lb.	lb.
August 14th—September 11th, 1902.		
5 cattle	3·40	3·60.
9 half-bred wethers (Leicester and Cheviot cross)	1·94	1·77
14 half-bred lambs	2·07	1·89
13 Cheviot ewes...	1·06	·79
Second Month.		
September 11th—October 9th, 1902.		
5 cattle	18·40	25·40
7 half-bred wethers	1·88	2·58
11 half-bred lambs	1·75	2·08
12 Cheviot ewes...	·625	1·31

The cattle were Irish heifers which were bought in the autumn of 1901 ; were wintered as "outliers" at Cockle Park, and were fed off for the butcher on pasture during the summer. They had received no concentrated food till the trial was commenced, and were sold as fat animals at the close of the trials. They received from 3 to 5 lb. of cake per head daily during the first month, and during the second month this was increased to 7 lb. per head daily. The cattle lingered near the feeding boxes during the first month, and did not graze so regularly as they did before receiving any cake, and this probably accounts for the small increase in the live weight during this period. The average weight of the cattle at the close of the trials was about 10 cwt. live weight.

The sheep and lambs were all grazed in two lots, one of which received Egyptian and the other Bombay cake. They also had received an allowance of $\frac{1}{4}$ lb. cake, increasing to $\frac{1}{2}$ lb. daily

during the second month. A larger amount would have been given but the sheep would not eat more of the Bombay cake, although they would have done so of the more palatable Egyptian cake. At the close of the trials the average weight of the wethers was 117 lb., of the lambs 79½ lb., and of the ewes 103½ lb. All the stock were in a healthy and thriving condition throughout the trials.

In connection with this Report the chemical composition of some samples of cotton-cakes, as given by Mr. S. Hoare-Collins, of the Durham College, is shown in the following table:—

—	Egyptian Cotton-Cake per cent.	Bombay Cotton-Cake per cent.	Indian Cottonseed per cent.
Moisture	14·13	12·41	10·5
Oil	5·17	5·35	14·7
Albuminoids	24·19	21·19	16·6
Carbo-hydrates	32·10	36·49	29·7
Woody fibre	19·31	18·65	23·3
Mineral matter	5·10	5·91	5·2
	100·00	100·00	100·00
Nitrogen	3·87	3·39	2·66
Sand	·05	1·24	1·10

Judging from these figures, Mr. Collins observes that the Bombay cotton-cake has a distinctly lower flesh-forming value than the cake of Egyptian origin, an inferiority which is not quite made up by the greater percentage of fat-forming constituents. In no way, however, can the difference between the two cakes be considered of much importance as regards their chemical composition. The physical character of the fibre of the two cakes is, however, very different; the fibre of the Bombay cotton-cake having an objectionable woolly nature. Considering the rather large amount of sand in the Bombay cake, as well as the points noted above, the Bombay cake will be seen to be slightly inferior, though this may be compensated for by the lower price.

British Breeding Stock in Russia.

The results of crossing native breeds of live stock in Russia with British strains was referred to by H.M. Consul-General for Odessa in his report for 1902.* In the report for the past year, Mr. Vice-Consul Bosanquet observes that the Shorthorn bull is said to make an excellent cross with the Kalmuck cow, while experiments in crossing with a Simmenthal bull have showed an increase in average weight of 61 to 62 per cent. The great struggle in South Russia for crossing purposes is now between the Shorthorn and Simmenthal breeds. Simmenthals have the start, having been introduced many years ago into Russia.

At the Kharkov Exhibition of live stock, which was probably the largest cattle show ever held in Russia, the exhibits of large cattle reared for meat were few, and the Kalmuck breed, which was formerly famous throughout Russia, was represented by only seven specimens. This breed declined when the rise in the price of corn tempted many landowners to plough their pastures, and now, when stock-breeding has taken an upward turn, attention is directed rather to crossing foreign breeds with the Russian than to developing the latter. The pure red Kalmuck breed, which is easy to keep and requires little attention, is probably more suitable for peasant holdings than a cross between Shorthorns and Kalmuck cows. Shorthorns thrive under conditions unattainable for a peasant, but the exhibits showed that the cross, properly carried out, gives very good results in an increase of size and weight. It is also stated that the cross produces oxen quite fitted for work at two years, whereas the average age of maturity for Russian oxen is five years. A cross between Shorthorns and Ukraine cows has also given excellent results, as shown in increased size and weight, improved milk, and earlier maturity.

The most interesting specimens of sheep grown for mutton were the Hampshire, Cotswold, Lincoln, Oxford, and Shropshire rams exhibited by Cooper Nephews. The Oxford and Shropshire rams shown by two Russian exhibitors produced a sufficiently favourable impression, and a cross between

* *Journal*, Vol. X., p. 257, Sept., 1903.

Lincoln rams and Volosh ewes showed an improvement in weight and in quantity of wool.

Pigs formed one of the best items of the show, and included Yorkshires, Berkshires, and Tamworths. One estate furnished 140 head of Yorkshires. This breeding establishment has existed for about twelve years, and has shown excellent results. Originally six sows and one boar were imported from the United Kingdom, and last year the estate possessed twenty carefully selected sows for breeding, while every two years new boars are purchased from the United Kingdom. The young pigs were all bought up the first day of the show. In the Yorkshire class of sows bred in Russia the gold medal went to a sow bred from live stock imported from the United Kingdom.

[*F.O. Report*, *Annual Series*, No. 3232.]

Railway Rates for Calves.

In the course of the correspondence which passed between this Department and the Railway Clearing House on the subject of railway rates for agricultural produce, of which a copy appeared in this *Journal* in May last (Vol. XI., pp. 65—79), reference was made to the question of the charges for the carriage of calves by passenger train. The Railway Clearing House have now informed the Board that it has been decided as from September 1st next to adopt the following scale for calves up to 140 lb. in weight, each calf being charged for separately, and the minimum for each consignment to be as for two dogs.

Up to 56 lb. in weight the ordinary parcels rates to be charged. Over 56 lb., and not exceeding 140 lb. in weight, the ordinary parcels rates up to 56 lb., and the excess above 56 lb., as follows :—

Up to	30 miles	$\frac{1}{8}$d. per lb.
,, ,,	50 ,, ...	$\frac{1}{4}$d. ,, ,,
,, ,,	100 ,, ...	$\frac{3}{8}$d. ,, ,,
,, ,,	200 ,, ...	$\frac{1}{2}$d. ,, ,,
Above	200 ,, ...	$\frac{5}{8}$d. ,, ,,

Sturdy or Gid in Sheep.

The disease known commonly under the names of sturdy, gid, turnsick, &c., is caused by the presence of a cyst, called *Cœnurus Cerebralis*, in the nerve centres, and more particularly in the brain. It is observed most frequently in lambs and shearlings, and more rarely in sheep over two years of age. The disease occurs occasionally in goats, oxen, and other ruminants. It is very rarely found in horses.

The disease is due to the *Taenia Cœnurus*, or tape-worm of the dog. This parasite lives in the small intestine and is comparatively common, especially in collie and other dogs in sheep-rearing districts. When mature it may reach the length of 40 inches, and is made up of a square-shaped head with an attenuated neck and a number of segments. These segments contain eggs, and when ripe and ready to drop off are well-marked objects, easily seen by the naked eye—about half an inch long and one-fifth of an inch wide. When mature and gorged with ova (which generally occurs in about two and a-half months after the dog has become infected by eating the cyst from the brain of an infected sheep), they are passed through the bowel and reach the ground, probably in the pastures where the sheep are feeding. They then decompose, and the eggs are set free. The rain washes the eggs over the grass, or into ditches or pools from which animals drink, and these in their turn become infected. A certain amount of moisture is requisite to maintain the vitality of these ova, as it has been proved by experiment that a fortnight's exposure to a dry atmosphere will destroy them entirely, whereas even after three months' exposure on damp grass the eggs have proved able to communicate the disease to lambs. Sturdy or gid is more common, therefore, in flocks that feed in damp pastures, or when the spring and summer have been rainy.

Having reached the stomach of the sheep the egg hatches out a six-hooked embryo which bores its way through the wall of the stomach, enters a blood-vessel, and is eventually carried in the blood to the brain, where it develops a cyst or bladder which gradually increases in size and brings about the symptoms characteristic of the disease. This cyst, which is the sole cause of sturdy, is a vesicle of variable size, and, though originally

very small, may become in two or three months as big as a hen's egg. Its outer coating is very thin and more or less distended by a limpid colourless fluid. The parent cyst develops on its surface scolices or larva, 100 to 200 in number; these appear as groups of white spots about the size of a millet seed, and each consists of the head of a future tape-worm and matures as such if, when the sheep dies or is operated on, the brain containing them, or the cyst itself, is thrown away and eaten by a dog. When this happens each larva of the tape-worm separates itself from the mother cyst in the intestine of the dog, where it becomes fixed in the mucous membrane and develops into the tape-worm as before described.

A diseased sheep may appear easily excited and very timid when approached, or it may be dull and stupid. Usually it is seen apart from the rest of the flock, walking about unsteadily and frequently turning round in a circle. It is seldom at rest for any length of time, and if disturbed may try to run away, but can only move helplessly round in one direction, often with its head carried unevenly on one side. In advanced cases the sheep may become blind. The symptoms vary, however, according to the position and size of the cyst. If it is near the surface of the brain and on one side, which is the most usual position, the affected animal walks round towards that side. If the cyst exists on both sides, it will circle to one side or the other at different times. If the cyst is situated in the middle the sheep raises its nose and walks straight forward, only stopping, as a rule, when it knocks up against something. If the cyst is lodged in the back of the brain, the head is raised and the sheep stumbles forward with a jerking uncertain motion of its limbs, breaking into a sort of shambling run, ending in a fall and a violent struggle to get up.

If left to itself the affected sheep refuses to eat, and by the combined effects of starvation and almost constant movement it wastes rapidly away and dies. Sheep over two years old and those that are strong and in good condition are rarely affected.

As a preventive treatment it is desirable not to keep more dogs than are necessary to tend the flock. In the springtime of each year the dogs should be tied up for a few days and given

a vermifuge or purge to expel worms. The object of tying them up is to see if any tape-worms are passed, and if so to collect and destroy them by burning. The heads of sheep which have been affected with gid should be burned or boiled and never left for dogs to eat.

In consequence of the serious nature of the disease and the frequently unsatisfactory results of treatment, nothing is, as a rule, attempted in the way of a cure, and the animals are generally sent to the butcher. This is the least expensive course to adopt and usually the most satisfactory.

In exceptional circumstances, however, as when the sheep is of considerable individual value, curative treatment may be attempted, but the operation is a delicate one and should only be attempted by a veterinary surgeon.

Tuberculosis in Pigs.

The attention of the Board of Agriculture and Fisheries has been drawn to the number of carcases of tuberculosed pigs which have of late been sent to the metropolitan and other markets for sale as human food, and to the fact that many persons who have forwarded such carcases have been prosecuted by the authorities and in some cases heavily fined. Pig-breeders and feeders should be careful, therefore, not to dispose of the carcases of pigs in which tuberculosis is present.

Tuberculosis is a disease which is by no means uncommon in pigs. It is most usually caused by feeding on diseased offal from cattle which have died of the disease, the parts commonly affected being the lungs. Especial care should be taken, therefore, to prevent swine from coming into contact with, or eating any part of, the internal organs of diseased cattle or other animals which may have died upon the farm. In those instances where the carcases of animals that have died have not been buried, the whole of the internal organs should be buried or burned.

Pigs are also liable to contract this disease if fed upon milk from a cow affected with tuberculosis of the udder. Milk drawn

from a cow which has one or more hard quarters should not be given to pigs unless it be first boiled.

The indications of tuberculosis in the pig consist mainly of hard swellings around the throat and the presence of white cheesy-looking deposits of tubercular material within or upon the intestines or the lungs. In the event of either of these conditions being found after death, the owner should not send the carcase to market without ascertaining from the sanitary inspector of his district, or from his veterinary surgeon, that the carcase is free from tubercular disease.

Compensation for Carcases Condemned for Tuberculosis.

The Select Committee of the House of Commons, to whom the Tuberculosis (Animals) Compensation Bill was referred, state in their report that they do not think that serious pecuniary loss is inflicted at present by the seizure and condemnation of the carcases of animals for tuberculosis upon butchers who deal in high-class meat, the vast majority of carcases seized being those of old dairy cows. The loss in respect of such cows is considerable, but the butcher who deals in them takes the probability of that loss into consideration in fixing the price he gives for them.

With regard to pigs, serious loss from seizures falls upon butchers slaughtering home-bred animals. Several witnesses complained that the recommendation of the Royal Commission on Tuberculosis that "the presence of tubercular deposit in any degree should involve seizure of the whole carcase" of a pig is too stringent, especially in view of the fact that the detection of tuberculosis in imported pigs is rendered exceedingly difficult by their importation without their heads and neck-glands.

The Committee have considered the question whether butchers can meet the risk of seizure by insurance at reasonable rates, and the difficulty which stands in the way of the general adoption of such a system is the variety of practice which at present exists with regard to the amount of tubercular deposit the existence of which in a carcase is held to justify its total condemnation. They recommend that power should be given

to the appropriate central authority in England, Scotland, and Ireland respectively to enforce uniformity in this matter upon all local authorities.

If such uniformity were enforced butchers would be able to insure themselves from loss by seizure on account of tuberculosis at reasonable rates in the case of animals presenting a healthy appearance before slaughter, for which a fair price for the purpose of human food had been given.

The Committee, however, do not think that the case of the butchers would be entirely met by provisions facilitating mutual or other insurance, and among other reasons they point out that the fact that the butcher bears at present the whole of the risk of seizure is a strong inducement to meat traders to deal in foreign meat, which was stated by several witnesses to be less liable to condemnation than the meat of home-bred animals. They recommend, therefore, that one-half of the loss should fall upon the public, and should be provided by the Imperial Exchequer.

[*H. C.* 272. *Price* 2*d.*]

Humane Slaughtering of Animals.

A committee was appointed in January, 1904, by the Board of Admiralty to ascertain the most humane and practicable methods of slaughtering animals for human food, and to investigate and report upon the existing slaughter-house system.

The main object in instituting the inquiry was a humanitarian one, and the committee, therefore, were solely concerned with the act of slaughter itself, and the conditions precedent thereto. The committee clearly recognised from the first that it would be futile to recommend any methods of slaughter, however humane, which would be impracticable on the score of complication, time, or expense, or which would in any way depreciate the utility or market value of the carcases for human food. To do otherwise, it is observed, would not only stultify their recommendations, but would do away with any justification for killing the animals at all. The committee, therefore, make no recom-

mendations which, in their opinion, are not strictly business-like and which have not been clearly demonstrated to be practical.

As the result of their enquiries and investigations the committee came to the conclusion that the methods of slaughter existing in this country are capable of considerable improvement, and they recommend :—

(*a*) That all animals, without exception, should be stunned, or otherwise rendered unconscious, before blood is drawn.

(*b*) That in the interests, not only of humanity, but of sanitation, order, and ultimate economy, it is highly desirable that, where circumstances permit, private slaughter-houses should be replaced by public abattoirs, and that no killing should be permitted except in the latter, under official supervision. Such a change as this could only be brought about gradually and by legislation, but it cannot be described as impracticable, in view of the fact that this system is prescribed by law in several Continental countries, and is actually enforced in the city of Edinburgh.

(*c*) That there should be an efficient system of inspection and supervision of all slaughter-houses, whether public or private, by the local authority, and uniformity in methods of slaughter should be introduced and enforced as far as possible ; and

(*d*) That all slaughtermen, and others employed in or about slaughter-houses, should be licensed by the local authority.

The committee are also of opinion that many of the slaughter-houses in this country are unsatisfactory in design, and present features which are objectionable from a humanitarian standpoint. They gave careful consideration to the question of the best design for a slaughter-house, and they make a number of valuable suggestions on this point. A model slaughter-house, embodying their recommendations, and many others conducive to rapidity and economy of working, is now being constructed by the Admiralty at Chatham Dockyard, and a detailed description, with plans, is attached to this Report.

Proceeding on the preliminary assumption that all animals should be stunned, or otherwise rendered unconscious, before being bled, the committee describe in detail the methods which they regard as the most humane, expeditious, and practical, and

recommend that they should be prescribed by bye-laws, or otherwise enforced.

However humane and scientific in theory may be the methods of slaughter, it is inevitable that abuses and cruelty may result in practice, unless there is a proper system of official supervision. This can only be satisfactorily effected in public abattoirs, which it is hoped will eventually become the only legal places of slaughter; but the committee are of opinion that much might be done in the meantime by the local urban and rural authorities if they took full advantage of the powers entrusted to them under the existing laws. In this connection special attention is drawn to an interesting memorandum prepared for the committee by the Local Government Board. From this it will be seen that private slaughter-houses, even in country districts, are not altogether beyond the reach of the local authority.

In many towns bye-laws have been drawn up regulating the methods of slaughter in public abattoirs. The committee are of opinion, however, that the clauses dealing with the methods of slaughter could with advantage be further defined, and they suggest certain clauses which they would like to see universally adopted and strictly enforced.

[*Cd.* 2150. *Price* 1s. 3d.]

Sleepy Disease of Tomatoes.

The sleepy disease of tomatoes, although known for some seasons in Great Britain, has acquired an increased importance among farmers, owing to the extended cultivation of the plant in recent years.

The plant may be diseased inside quite young, but the outward manifestations do not necessarily appear at once. The first indication that the tomato is affected is shown in the drooping of the leaves and their bad colour. If the root is split, the woody portion is seen to be of a dingy yellowish brown colour, which becomes more marked if left open for half a day. When the plant has been attacked about three weeks the lower portion of the stem is usually covered with a

delicate white bloom. Eventually the stem is covered with patches of a dull orange colour, and becomes very much decayed. The disease can always be identified by a brownish ring just within the bark at the base of the stem or thicker branches of the root.

The disease is due to a fungus which flourishes in the soil and enters the plant by the root. During its development it passes through three stages, known as the *Diplocladium* stage, the *Fusarium* stage, and the *Chlamydospore* stage. The first stage usually lasts about a week, and during the last stage the spores are resting and preparing to attack the young plants another year, or whenever a suitable opportunity presents itself. The disease is not capable of attacking the plant in any stage of its existence except the last.

Treatment.

1. It must be remembered in the first place that diseased plants never recover, and therefore no attempt to save the plant is successful.

2. As the disease grows inside the plant it is useless to spray with a fungicide.

3. As the resting spores of the fungus live and thrive in the earth and attack the plant through the root the disease must be attacked in that quarter.

It is therefore recommended that :—

1. All diseased plants should be uprooted immediately the disease is noticed, and should be burnt.

2. The soil in which the plants grew should be removed and sterilised by heat, or mixed with a liberal allowance of quicklime.

3. If the disease appears in a glass house, every part of the house should be washed with a solution of carbolic acid and water (1 to 20 parts of water) after the soil has been removed.

4. If it is not practicable to remove the soil, it should receive a liberal dressing of gas-lime. This should be allowed to lie on the surface for ten days, and should afterwards be thoroughly incorporated with the soil. After this the soil should remain for at least ten weeks before anything is planted in it. It should be soaked with water once a week.

5. As much lime as the plants will allow should be mixed with the soil in which tomatoes are grown, more especially if they are grown in the same beds during successive seasons.

6. The infected soil from a bed should not be thrown out at random, but should be sterilised by a mixture of quicklime, and care should be taken not to bring it in contact with tomato beds.

7. Only short-jointed sturdy plants should be used, and those should be fairly hard and the foliage of a dark bronze appearance. All spindly or drawn plants should be rejected.

8. The plants should be allowed plenty of air, light, and room for growth.

Beetles on Mushrooms.

The Board recently received some specimens of insects which were reported as causing considerable havoc in mushroom beds. The specimens included two different species of adult beetle, one of which was identified as one of the rove beetles, or *Staphylinidæ*, and of the genus *Quedius*. These rove beetles are very quick in their movements and very voracious, feeding both on a carnivorous diet (live small animals, *e.g.*, worms, and rotting animal matter) and on vegetable matter. Characteristic places for their breeding and shelter are heaps of rotting plant matter and manure.

The other beetle proved to be *Aphodius fimetarius*, one of the dung beetles. In an infestation of this kind the manure of the mushroom beds may harbour some of the pests, and this should be carefully examined before the beds are made up. All likely breeding or shelter places should be cleared away, such as heaps of rotting vegetable matter, in the neighbourhood. Trapping the beetles which are at work should be diligently practised. The traps could be "baits" of, say, pieces of "lights" or liver placed here and there over the beds; these should be frequently examined, and the beetles destroyed by dropping them into a little paraffin. If it were possible to place the "bait" in small basins with steep slippery sides sunk to the level of the bed, many of the insects which had

entered would be unable to climb the sides of the basin. A number could also be caught by arranging here and there tarred boards, care being taken that the tar be renewed often enough to keep the "trap" moist and sticky.

Apple Scab.

Some specimens of apples attacked by "apple scab," *Fusicladium dendriticum*, have recently been forwarded to the Board. This fungus first appears on the leaves, and thence passes on to the young fruit. It is now too late to spray; but all diseased fruit should be collected and burned. It would be useful next spring to spray at intervals with dilute Bordeaux mixture, commencing first when the blossom is expanding.

Some black currant leaves badly infested with *Glœosporium ribis* have also been received. This fungus is very injurious during certain seasons to the foliage of currants and gooseberries. The diseased leaves should be collected as they fall and burned; and in the spring the bushes should be sprayed with dilute Bordeaux mixture when the leaf-buds expand.

Spraying for Codling Moth.

Some experiments have been carried out by the Department of Agriculture of Victoria with a view of testing the efficacy of various solutions for destroying Codling Moth. The caterpillars of this moth are exceedingly destructive to the apple and pear crop in this Colony, but growers are said to be dubious of the efficacy of arsenical compounds as a means of combating the pest. Their value, however, when properly applied, seems to be clearly demonstrated in these experiments, which are therefore of considerable interest to fruit growers in this country. The use of Paris green, it may be observed, is recommended in the Board's leaflet No. 30, but in these experiments spraying was carried out more frequently than is suggested therein.

Blocks of trees were selected in orchards where the moth was very prevalent, and the trees were sprayed from four to seven times in the course of four months. The Paris green solution

was made up as follows :—Paris green, 1 lb. ; fresh lime, 8 lb. ; treacle 2 lb., added to 160 to 180 gallons of water. The arsenic solution was composed of white arsenic, 1 lb. ; washing soda, 2 lb. ; fresh lime, 24 lb. ; treacle, 6 lb. ; added to 320 gallons of water. Arsenic was found to be quicker in its action on the insects than Paris green, but it was not nearly so lasting, and, judging by results, the Paris green proved undoubtedly as good as, if not superior, to the arsenic and less dangerous to the foliage.

The method of making the Paris green solution was as follows :—The fresh lime was first slaked, and then placed in a barrel and mixed with water in the proportion of 1 lb. of lime to each gallon of water ; this was thoroughly stirred, the treacle added, and left to stand all night. In the morning this lime water was drawn off and put in the vat of the spraying machine with the necessary water and the Paris green added. The Paris green, however, was first thoroughly mixed with about a quart of the lime water. The quantity used was about 210–220 gallons per acre, and the cost, including labour in Victoria, was about 33s. per acre, or 4d. per tree. An 80-gallon pump drawn by one horse and worked by three men was used.

All the fruit was carefully examined, and while the sprayed trees showed only 6 per cent. of infected fruit when Paris green was used, the unsprayed trees yielded 40 per cent. of infected fruit. There is, it is stated, no danger from the use of these arsenical compounds, as there is hardly a trace to be found by analysis on the fruit, though there is sufficient to destroy the microscopic caterpillar on its emergence from the egg. The fact that there were three distinct broods of moths during the season in Victoria shows the necessity for frequent spraying. In England there is normally only one brood in a season, but in some cases there are two.

The value of trapping the caterpillars by bandages on the trees is recognised, but it is pointed out that when a caterpillar is trapped a fruit has been destroyed, whereas by spraying the caterpillar is killed and the fruit saved. Sprayed apples have been observed with as many as twelve attempts at entrance by the caterpillars, failure resulting in each case, whereas in unsprayed fruit as many as five full-grown caterpillars have been found in a single fruit.

Inclusion of Cartage Charges in Railway Rates.

The Board desire to draw the attention of farmers to the fact that it may occasionally happen, through an oversight, that the rate charged by railway companies for the conveyance of goods, particularly in the case of small consignments, may include a charge for collection and delivery, when, as a matter of fact, the collection and delivery have not been performed by the companies themselves.

A case of this kind was recently brought to the notice of the Board by one of their honorary agricultural correspondents, in which a farmer was charged an apparently excessive rate for carriage of straw by rail. On enquiry it was ascertained that included in that sum were charges for collection and delivery, and loading and unloading, both at the forwarding and receiving stations, services which in this case were not performed by the railway companies concerned.

When this was pointed out the railway companies at once agreed to give a rebate for the proportion of the rate assigned for collection and delivery and loading and unloading.

Farmers should be careful, therefore, to see that the rates charged on their goods are exclusive of cartage when consignments are only made from station to station.

Recent Publications of the Board.

The Board of Agriculture and Fisheries have now issued the first hundred of their leaflets in book form, so that farmers and others may more easily keep them for purposes of reference. They are neatly bound in stiff boards, and may be obtained post free from the Office of the Board, 4, Whitehall Place, London, S.W., price 6d. The leaflets included in this set comprise 8 leaflets relating to Acts of Parliament; 16 dealing with farm animals, including poultry; 10 dealing with wild birds; 49 dealing with insects and fungi injurious to crops; and 17 dealing with miscellaneous subjects of interest to farmers.

The list of leaflets has recently been enlarged by the following additions, of which single copies may be obtained free of charge

on application as above: The Mussel Scale (No. 107); Contagious Abortion in Cattle (No. 108); Carriage of Milk by Rail in Locked Cans (No. 110); Co-operative Egg and Poultry Societies (No. 111); Weeds and their Suppression (No. 112); Dry Rot (No. 113); Feeding of Poultry (No. 114).

New Zealand Legislation.

The New Zealand Government have recently passed two Acts which are now in operation in the Colony. The Products Exports Act (No. 35 of 1903) provides that grain, hops, hemp, fruit-pulp, apples, pears and poultry exported from New Zealand must bear a prescribed stamp or mark, or a certificate in writing as to quality and condition, signed by a duly authorised official. The exportation of any product may be exempted from the provisions of the Act by Order in Council.

Another Act (No. 67 of 1903) prohibits the importation of diseased plants, and provides for the eradication of diseases affecting orchards and fruit trees, and the prevention of their dissemination in the Colony.

An Agricultural Students' Association.

The Agricultural Students' Association of the Durham College of Science, which was established in 1901, now numbers 91 members. The objects of the association (as stated in the rules) are to unite together the students past and present of the agricultural department of the college, and to promote the study and development of agriculture. Two prizes are offered for competition annually (*a*) for the best essay having a direct bearing on agriculture or some branch thereof, *e.g.*, crops, stock, land, buildings, machinery, statistics, economics, systems of farming, biographies of famous agriculturists; and (*b*) for the best agricultural experiment carried out and reported on by a member or members. The association also distributes to members copies of publications dealing with

agricultural experiments and other subjects of educational interest; it holds occasional meetings; organises excursions to agricultural shows and experiment stations; and publishes a report of its proceedings, which contains the essays for which prizes have been awarded. Such associations, as a means of keeping old students in touch with each other and as an agency for stimulating after-college reading and research, are most useful.

Employment of Soldiers for Harvesting.

In reply to a question in the House of Commons, Mr. Arnold Forster said that under paragraph 160 of the King's Regulations, General Officers Commanding are given power to use their discretion in allowing soldiers to be employed in the harvest work provided the employment of the population is not thereby interfered with.

Physical Deterioration Committee.

The importance of a sufficient supply of good cow's milk as a factor in the health of the people came under the consideration of the Departmental Committee on Physical Deterioration, and with a view of ensuring the purity of the supply the Committee recommend the general application of the permissive provisions of the Contagious Diseases (Animals) Act, 1878. The Local Government Board under that Act may make orders, or may authorise a local authority to make orders, for the registration of cow-keepers, dairymen, &c.; for the inspection of cattle in dairies; for prescribing the lighting, ventilation, drainage, &c., of dairies and cowsheds; for securing the cleanliness of milk stores, shops and vessels; and for prescribing precautions for protecting milk against infection or contamination. The Committee think that in default of the local sanitary authority taking proper precautions the County Council should in all cases be authorised to act, and in the ultimate resort it should be the duty of the Local Government

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Board to intervene. It is of great importance, they say, that the milk supply should pass through as few hands as possible, and that milk vendors should not be general dealers whose sale of milk is confined to a few quarts.

Having regard to the difference of medical opinion as to the effects of sterilisation, the Committee recommend an investigation into the whole subject by a small body of experts. Milk when drawn from the cow, should at once be cooled to a temperature of 40 deg. F.

With a view to combating the evils resulting from the constant influx from country to town, the Committee recommend that every effort should be made by those charged with the conduct and control of rural schools to open the minds of the children to the resources and opportunities of rural existence. School attendance in rural districts should not be compulsory till the age cf six, or possibly seven, and should be discouraged, if not absolutely prohibited, under five.

Another cause which, it is stated, tends to swell the stream of emigration towards the town, is the difficulty of obtaining cottages. Local authorities are advised to apply themselves to remedying the dearth of cottages which exists in many parts of the country by the exercise of their powers under Part III. of the Housing Act, 1890, as amended by the Act of 1900.

[*Cd.* 2175. *Price* 1*s.* 2*d.*]

LIVE WEIGHT PRICES OF CATTLE.

The returns received from the twenty-one places in Great Britain scheduled under the Markets and Fairs (Weighing of Cattle) Act, 1891, shew that the number of cattle entering these markets during the first half of 1904 was 589,740, as compared with 624,895 in the same period of 1903, or a decline of over 35,000 head. The number of sheep declined by 17,400 head, but swine increased by over 11,000. The details of the number of stock shewn and the number for which weights and prices were furnished by the market authorities and auctioneers at each place, during the first six months of the current year, are given in Table II.

At York, Birmingham, and Bristol the weighbridge appears to have remained unused, and at Ashford, Lincoln, and Norwich the number weighed continues to be insignificant. The largest number of cattle returned as weighed at any one market was 14,550 at Edinburgh; while 12,831 were weighed at Aberdeen and 10,024 at Shrewsbury. At the latter market, however, the great majority were stores. Sheep were only weighed in any number at six of the twenty-one markets, the largest totals being reported from Aberdeen and London; while of the few swine weighed nearly three-fourths were returned at Newcastle.

The total number of cattle for which prices were returned with quality distinguished was very slightly less than in 1903, so that, in view of the numbers shewn, the percentage which this figure bears to the total, viz., 12·16 per cent., is a little higher. As has always been the case, very much greater use was made of the weighbridge in Scotland than in England, and in the former country the number of cattle priced, with quality distinguished, amounted to 31·4 of the total shewn, as against only 5·6 in England.

Considering the average course of prices during the first half of the present year, as deduced from the returns at these markets, the following table shews that while there was not much change in the price of fat cattle during the four months January to April, there was an appreciable rise in May, followed by a sharper increase of 3s. per cwt. in June.

Owing to the rapid rise, the prices ruling in June, 1904, both for first and second quality, were decidedly above the quotations at the same date in 1903, whereas, at the commencement of the year, the reverse was the case. Prices, however, have not reached the high level that they attained two years ago.

TABLE I.—*Average Price of* FAT CATTLE (*Weighed and Priced with Distinction of Quality*) *at the Twenty-one Markets.*

Month.	Prime or First Quality.		Good or Second Quality.	
	1904.	1903.	1904.	1903.
	Per cwt. *s. d.*	Per cwt. *s. d.*	Per cwt. *s. d.*	Per cwt. *s. d.*
January	35 2	37 8	32 10	36 2
February	34 8	37 0	32 2	35 0
March	34 6	37 0	32 0	35 4
April	34 10	37 2	32 6	35 2
May...	35 6	36 8	33 4	34 6
June	38 4	36 8	36 6	34 10

In Table IV. are given particulars of the average prices, during six months, of cattle at those thirteen markets where the statistics are sufficient to allow of a reliable average being struck. From this table it will be seen that the average price of prime or first quality was highest (36s. 10d. per cwt.) in London and lowest (33s. 2d. per cwt.) at Leicester. For second quality, Leicester also recorded the lowest price (26s. 10d.) but the highest quotations for this grade were reported from Glasgow (34s. 8d.) and Edinburgh (34s. 4d.).

Of cattle sold at an agreed price per stone or per cwt. live weight there were 5,472, more than half these transactions taking place at Glasgow.

Shrewsbury continues to be practically the only one of the scheduled markets where store cattle are reported to have been weighed, the number at this town amounting in the six months to 8,644 head. The average prices realised for the 8,144 weighed stores which were priced at Shrewsbury were 35s. 10d., 33s., and 30s. per cwt., for first, second, and third quality respectively.

TABLE II.—CATTLE, SHEEP, AND SWINE *entering and weighed at the Markets and Marts of the undermentioned Places, during the six months ended* JUNE, **1904**, *as returned under the Markets and Fairs (Weighing of Cattle) Act*, 1891 (54 *and* 55 *Vict. c.* 70).

PLACES.	Cattle.			Sheep.			Swine.		
	Total Number entering the Markets or Marts.	Number Weighed.	Number Weigh'd for which Prices were given.	Total Number entering the Markets or Marts.	Number Weighed.	Number Wgh'd for which Prices were given.	Total Number entering the Markets or Marts.	Number Weighed.	Number Wgh'd for which Prices were given.
ENGLAND.	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*
Ashford ...	6,683	84	—	35,505	—	—	8,088	—	—
Birmingham ...	9,832	—	—	18,319	—	—	130,624	—	—
Bristol... ...	27,134	—	—	37,478	—	—	—	—	—
Carlisle ...	33,631	5,610	5,610	76,865	—	—	7,446	—	—
Leicester ...	31,328	725	725	27,813	—	—	5,749	—	—
Leeds	18,680	2,221	2,221	65,240	1,671	1,671	1,754	—	—
Lincoln ...	5,103	16	—	34,796	—	—	9,564	99	75
Liverpool ...	19,238	2,381	2,381	129,731	1,235	1,235	144	14	14
London ...	29,715	6,350	1,924	267,610	4,494	—	480	—	—
Newcastle-upon-Tyne ...	46,272	2,204	2,204	138,940	—	—	22,891	729	729
Norwich ...	58,901	188	130	89,901	—	—	18,648	—	—
Salford ...	48,176	1,732	—	233,101	—	—	918	—	—
Shrewsbury ...	33,606	10,024	9,521	20,547	—	—	9,387	—	—
Wakefield ...	31,957	2,247	—	93,165	2,497	—	3,751	17	—
York	39,844	—	—	34,537	—	—	6,471	—	—
SCOTLAND.									
Aberdeen ...	26,794	12,831	12,831	71,863	9,949	9,949	7,007	—	—
Dundee ...	9,954	5,202	5,202	11,799	1,370	1,370	1,647	—	—
Edinburgh ...	31,298	14,550	*6,716	136,293	63	63	3,411	—	—
Falkirk ...	5,623	1,765	1,765	3,815	—	—	61	—	—
Glasgow ...	28,317	7,741	6,421	123,110	439	146	3,612	—	—
Perth... ...	47,654	6,205	*3,326	155,422	692	692	7,718	179	179
TOTAL for ENGLAND ...	440,100	33,782	24,716	1,303,548	9,897	2,906	225,915	859	818
TOTAL for SCOTLAND ...	149,640	48,294	36,261	502,302	12,513	12,220	23,456	179	179
Total ...	589,740	82,076	60,977	1,805,850	22,410	15,126	249,371	1,038	997

* Prices for 7,834 cattle in addition to the above were quoted from Edinburgh and for 2,879 cattle from Perth, but without distinguishing the quality.

TABLE III.—CATTLE, SHEEP, AND SWINE, *entering, weighed, and priced at the Scheduled Places in Great Britain, during the six months ended* JUNE, **1904**, and **1903**, *respectively.*

Animals.	Six Months ended June, 1904.	Six Months ended June, 1903.
CATTLE:	No.	No.
Entering markets	589,740	624,895
Weighed	82,076	88,466
Prices returned	71,690	73,766
Prices returned with quality distinguished ...	60,977	61,061
SHEEP:		
Entering markets	1,805,850	1,822,252
Weighed	22,410	20.306
Prices returned with quality distinguished ...	15 126	16,711
SWINE:		
Entering markets	249,371	238,262
Weighed	1,038	1,508
Prices returned with quality distinguished ...	997	1,492

TABLE IV.—*Prices of* FAT CATTLE *during the six months ended* JUNE, **1904**.

PLACES.	PRIME or First Quality.			GOOD or Second Quality.			INFERIOR or Third Quality.		
	Number.	Price per Stone.	Price per Cwt.	Number.	Price per Stone.	Price per Cwt.	Number.	Price per Stone.	Price per Cwt.
		s. d.	*s. d.*		*s. d.*	*s. d.*		*s. d.*	*s. d.*
Carlisle ...	2,769	4 4	34 8	1,775	3 10½	31 0	1,066	3 4	26 8
Leicester ...	509	4 1¾	33 2	133	3 4¼	26 10	—	—	—
Leeds ...	1,302	4 4	34 8	919	3 10¼	30 10	—	—	—
Liverpool ...	1,300	4 3	34 0	754	3 7	28 8	327	3 0¼	24 2
London ...	1,163	4 7¼	36 10	741	4 2¼	33 6	20	3 2	25 4
Newcastle...	2,074	4 6¾	36 6	130	3 11½	31 8	—	—	—
Shrewsbury	424	4 3½	34 4	550	4 0½	32 4	403	3 6¾	28 6
Aberdeen ...	4,249	4 5½	35 8	5,058	4 1	32 8	3,248	3 1¼	24 10
Dundee ...	1,557	4 5½	35 8	2,472	4 1¾	32 10	1,150	2 11½	23 8
Edinburgh...	414	4 5¼	35 6	6,123	4 3½	34 4	—	—	—
Falkirk ...	504	4 6	36 0	842	4 2¾	33 10	419	3 10½	31 0
Glasgow ...	4,676	4 5½	35 8	1,472	4 4	34 8	273	4 1¼	32 10
Perth ...	849	4 4½	35 0	1,135	4 0¾	32 6	1,342	3 8¾	29 10

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of July, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	8 1	7 7	39 9	37 2
Herefords	8 0	7 7	—	—
Shorthorns	7 11	7 5	39 1	36 3
Devons	8 1	7 7	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	7¾	7	8¾	7
Sheep :—				
Downs	8½	8	8¾	—
Longwools	8	7¼	8¾	7¼
Cheviots	8¾	8¼	9¼	8¼
Blackfaced	8½	7¾	8¾	8
Cross-breds	8½	7¾	9¼	8½
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	5 6	5 3	5 9	5 2
Porkers	5 11	5 8	6 4	5 7
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
In Milk	20 17	17 14	20 0	16 3
Calvers	20 10	17 10	19 2	15 8
Calves for Rearing	2 6	1 15	2 4	1 12
Store Cattle :—				
Shorthorns—Yearlings ...	8 12	7 3	9 12	7 16
,, Two-year-olds	12 6	11 3	14 8	12 7
,, Three-year-olds	15 3	13 6	16 8	15 4
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools—Hoggs, Hoggets, Tegs and Lambs	34 2	29 5	—	—
Scotch Half-breds ,, ...		—	36 1	30 9
Store Pigs :—				
Under 3 months	16 11	13 5	23 0	16 3
Over 3 months	31 4	24 8	31 4	26 1

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of July, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	57 2	55 1	57 2	56 0	61 10*	63 0*
	2nd	54 10	47 7	47 10	50 2	57 2*	57 2*
Cow and Bull ...	1st	—	46 11	46 8	46 8	47 10	46 8
	2nd	—	39 11	42 0	37 4	42 0	42 0
U.S.A. and Canadian :—							
Birkenhead killed	1st	53 8	52 6	52 6	52 6	54 10	56 0
	2nd	49 0	47 3	47 10	46 8	—	50 2
Argentine Frozen Hind Quarters ...	1st	39 8	38 3	39 8	37 4	38 6	37 4
American Chilled Hind Quarters ...	1st	64 2	62 1	61 10	59 6	61 10	63 0
VEAL :—							
British	1st	61 10	59 6	59 6	66 6	—	67 8
	2nd	53 8	49 0	52 6	56 0	—	63 0
MUTTON :—							
Scotch	1st	77 0	—	72 4	73 6	82 10	75 10
	2nd	72 4	—	70 0	66 6	68 10	56 0
English	1st	68 10	66 6	70 0	70 0	—	—
	2nd	61 10	53 8	63 0	63 0	—	—
Argentine Frozen ...	1st	35 0	36 2	35 0	33 10	35 0	36 2
LAMB :—							
British	1st	79 4	73 3	73 6	77 0	84 0	80 6
	2nd	71 2	65 1	68 10	66 6	80 6	73 6
New Zealand ...	1st	54 10	55 9	54 10	53 8	57 2	57 2
	2nd	52 6	51 7	—	49 0	54 10	54 10
Australian	1st	50 2	—	—	—	46 8	—
	2nd	49 0	—	—	42 0	—	—
PORK :—							
British	1st	49 0	48 1	—	51 4	49 0	49 0
	2nd	44 4	39 2	—	43 2	45 6	40 10

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each of the under-mentioned Weeks in 1904, and in the corresponding Weeks in 1903 and 1902.

Weeks ended (*in* 1904).	Wheat.			Barley.			Oats.		
	1902.	1903.	1904.	1902.	1903.	1904.	1902.	1903.	1904.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 2 ...	27 7	25 0	26 3	26 7	23 11	22 1	19 10	16 10	15 5
,, 9 ...	27 8	24 11	26 6	26 7	24 1	22 6	20 0	17 0	15 7
,, 16 ...	27 8	24 11	26 11	26 11	24 1	22 3	20 0	16 10	15 9
,, 23 ...	27 7	25 0	27 3	26 7	24 1	22 4	20 3	16 11	15 11
,, 30 ...	27 4	25 4	26 11	26 7	24 3	22 3	20 2	17 0	15 8
Feb. 6 ...	27 2	25 6	26 9	26 9	23 9	22 4	20 3	16 11	15 11
,, 13 ...	26 11	25 6	26 8	27 5	23 7	22 2	20 3	17 1	15 9
,, 20 ...	27 1	25 4	26 11	26 11	23 4	22 7	20 4	17 1	16 0
,, 27 ...	27 1	25 3	27 10	26 8	23 2	22 4	20 5	17 1	16 3
Mar. 5 ...	27 0	25 3	28 8	26 8	23 1	22 6	20 5	17 1	16 5
,, 12 ...	27 1	25 1	29 1	26 6	22 10	22 5	20 6	17 0	16 8
,, 19 ...	27 1	25 1	28 6	26 4	22 9	22 9	20 6	16 10	16 7
,, 26 ...	27 2	25 2	28 2	27 2	22 4	22 8	20 7	17 0	16 7
Apl. 2 ...	27 3	25 3	27 11	26 5	22 6	22 10	20 6	17 0	16 6
,, 9 ...	27 5	25 4	27 10	26 7	21 10	22 5	21 0	17 2	16 5
,, 16 ...	27 7	25 6	27 9	27 1	21 6	22 6	21 1	17 3	16 4
,, 23 ...	28 9	26 1	27 9	26 5	21 9	22 0	21 6	17 9	16 4
,, 30 ...	29 9	26 10	27 8	27 5	22 1	21 1	21 10	18 0	16 3
May 7 ...	30 9	27 6	27 4	26 10	21 10	20 8	22 6	18 2	16 7
,, 14 ...	31 1	27 9	27 1	25 3	22 5	19 10	22 5	18 4	16 6
,, 21 ...	31 6	27 10	26 9	25 4	23 7	20 4	22 6	18 5	16 7
,, 28 ...	31 6	27 8	26 9	25 1	23 7	19 8	22 10	18 5	16 7
June 4 ...	31 3	27 6	26 10	24 3	23 10	18 8	22 11	18 4	16 8
,, 11 ...	30 11	27 8	26 6	23 8	21 5	18 5	22 8	18 7	16 10
,, 18 ...	30 6	27 6	26 5	23 5	20 7	18 2	23 0	18 3	16 8
,, 25 ...	30 5	27 6	26 5	24 3	22 0	19 2	22 9	18 6	16 10
July 2 ...	30 8	27 9	26 4	25 5	20 7	18 8	22 5	18 6	17 1
,, 9 ...	30 10	28 1	26 6	24 8	19 11	19 8	22 10	18 3	17 1
,, 16 ...	30 11	28 3	26 10	23 8	20 5	18 9	22 10	18 7	17 6
,, 23 ...	31 5	28 7	27 7	25 0	20 10	18 10	22 8	18 5	17 6
,, 30 ...	31 8	28 11	28 0	25 0	21 0	19 9	22 10	18 6	17 10
Aug. 6 ...	31 7	29 3	28 3	24 11	20 1	19 9	22 11	18 8	17 10
,, 13 ...	31 7	29 11	28 4	24 9	21 3	19 9	22 2	18 10	17 7
,, 20 ...	31 5	29 9		22 10	20 4		21 11	18 6	
,, 27 ...	31 7	30 0		26 2	22 3		21 0	18 7	
Sept. 3 ...	29 9	30 3		24 6	22 5		19 10	18 5	
,, 10 ...	27 10	28 6		27 5	22 4		19 2	17 0	
,, 17 ...	27 1	27 5		26 4	24 2		18 4	16 4	
,, 24 ...	26 6	27 0		26 4	24 0		18 0	16 2	
Oct. 1 ...	25 10	26 3		25 11	23 9		17 5	15 9	
,, 8 ...	25 5	25 10		26 2	23 8		17 2	15 6	
,, 15 ...	25 1	25 8		26 1	23 9		17 0	15 5	
,, 22 ...	24 11	25 10		26 4	23 7		17 0	15 8	
,, 29 ...	25 0	26 0		26 7	24 2		17 3	15 8	
Nov. 5 ...	25 1	26 4		26 3	24 3		17 2	15 9	
,, 12 ...	25 0	26 6		25 11	24 6		17 3	15 9	
,, 19 ...	24 11	26 9		25 6	24 3		17 2	15 10	
,, 26 ...	25 0	26 6		24 11	23 11		17 0	15 11	
Dec. 3 ...	25 1	26 8		24 4	23 9		17 0	15 9	
,, 10 ...	25 0	26 7		24 3	23 2		16 10	15 9	
,, 17 ...	24 10	26 9		24 2	23 0		16 10	15 7	
,, 24 ...	24 10	26 5		24 1	22 5		16 8	15 6	
,, 31 ...									

AVERAGE PRICES of **Wheat, Barley, and Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1903.	1904.	1903.	1904.	1903.	1904.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	June ...	41 3	34 9	24 2	21 5	19 3	16 0
	July ...	40 11	34 7	24 1	21 1	18 10	15 11
Paris:	June ...	42 7	34 7	24 9	20 5	19 0	15 11
	July ...	42 9	35 2	24 5	20 4	18 11	16 8
Belgium:	April ...	27 10	30 0	22 7	21 7	17 3	15 3
	May ...	28 10	30 0	22 2	21 5	17 7	15 6
Berlin:	May ...	36 1	38 4	—	—	18 2	17 4
Breslau:	May ...	32 1	37 3	23 4	22 3	18 4	16 2

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets.*

AVERAGE PRICES of **British Wheat, Barley** and **Oats** at certain Markets during the Month of July, 1903 and 1904.

—	Wheat.		Barley.		Oats.	
	1903.	1904.	1903.	1904.	1903.	1904.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	27 8	26 3	21 4	18 5	19 3	17 11
Norwich	27 8	27 0	20 2	22 0	17 9	16 2
Peterborough ...	27 10	25 9	19 9	18 8	17 11	16 4
Lincoln	27 11	26 3	20 7	17 5	17 7	16 5
Doncaster	27 5	25 10	—	—	18 1	17 5
Salisbury	28 4	26 7	21 0	18 9	19 2	17 4

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of July, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British	12 1	10 11	—	—	—	—	11 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	94 10	92 10	92 10	90 5	91 7	87 2	90 10	—
Danish ...	102 5	100 10	104 2	101 0	102 5	98 10	101 5	—
Russian ...	84 0	80 0	86 0	80 0	84 0	78 10	84 2	80 10
Australian ...	88 6	83 7	—	—	—	—	86 0	80 0
New Zealand...	92 10	88 5	—	—	—	—	90 0	82 0
CHEESE :—								
British Cheddar	65 7	60 10	—	—	72 0	68 0	51 10	46 10
			120 lb.	120 lb.	120 lb.	120 lb.		
,, Cheshire	—	—	49 0	40 0	50 0	43 10	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	41 0	38 2	41 6	39 3	39 11	37 8	42 0	40 0
BACON :—								
Irish	61 0	54 5	56 0	51 7	56 10	52 7	60 2	58 0
Canadian ...	51 0	45 8	48 2	42 10	46 5	43 10	44 2	42 7
HAMS :—								
Cumberland ...	94 10	85 2	—	—	—	—	—	—
Irish	92 0	84 10	—	—	—	—	95 2	85 2
American ...	53 10	49 7	56 7	52 10	53 0	48 5	53 7	50 2
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	11 4	10 1	—	—	—	—	—	—
Irish	9 8	7 10	7 5	6 7	7 3	6 4	7 6	6 7
Danish ...	8 9	7 7	8 6	6 10	8 3	7 7	7 9	6 10
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Main Crop ...	80 0	60 0	—	—	78 4	68 4	—	—
Up-to-Date ...	60 0	40 0	58 0	—	96 8	80 0	—	—
HAY :—								
Clover... ...	85 6	72 0	83 6	70 4	80 0	75 0	86 8	81 10
Meadow ...	80 0	69 0	68 0	54 8	57 6	45 0	—	—

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	July.		7 Months Ended July.	
	1904.	1903.	1904.	1903.
Swine-Fever:—				
Outbreaks	117	100	915	979
Swine Slaughtered as diseased or exposed to infection ...	475	668	4,338	4,859
Anthrax:—				
Outbreaks	82	46	612	475
Animals attacked	111	63	932	732
Glanders (including Farcy):—				
Outbreaks	150	147	919	830
Animals attacked	262	230	1,649	1,365
Sheep-Scab:—				
Outbreaks	5	10	931	1,075

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	July.		7 Months Ended July.	
	1904.	1903.	1904.	1903.
Swine-Fever:—				
Outbreaks	43	32	117	96
Swine Slaughtered as diseased or exposed to infection ...	589	379	2,462	1,943
Anthrax:—				
Outbreaks	...	...	2	2
Animals attacked	...	...	2	3
Glanders (including Farcy):—				
Outbreaks	3	...	8	1
Animals attacked	3	...	24	2
Rabies (Number of Cases):—				
Dogs	...	2	...	2
Sheep-Scab:—				
Outbreaks	*10	*12	*365	*392

* These figures refer to June, and to the periods ending June, respectively.

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THE QUESTION OF QUALITY IN WHEAT.

In all agricultural produce the question of "quality" is of the greatest importance, determining as it often does whether a given crop can be grown at a profit or not. This is particularly the case with the British farmer, who, with his high fixed charges for rent and kindred services and his intensive methods of cultivation, is more dependent upon a large monetary return per acre than is any other farmer in the world. What precisely constitutes "quality" in any agricultural product is always a very subtle question, and the conditions under which it is attained are also difficult to follow; particular varieties and methods of cultivation are more successful than others, but, generally speaking, quality is more dependent on soils and seasons than on the work of the cultivator. Very often, again, high quality is associated with a comparatively poor yield, because quality is generally dependent upon perfect maturity, and the manuring given to produce a big crop may induce too prolonged growth. In the case of wheat the current market prices show that certain very marked differences of quality must exist. During the season of 1903–4, for example, No. 1 Hard Manitoba has been selling at about 35s. per quarter, Hard Winter Kansas and Russian wheats at about 33s., while the best English wheat was not fetching more than 28s. or 29s.

Though there are many elements determining the price of wheat—dryness, cleanliness, condition, &c.—the main factor causing English wheat to occupy such a low position in the scale is its comparative lack of what the baker calls "strength," *i.e.*, the capacity to make a large loaf. The photograph of loaves

made from Manitoban and average English flour (Fig. 1) illustrates more clearly than any description the meaning of "strength"; both loaves contain approximately equal weights of flour, salt, yeast, yeast food, &c., and have been baked in the same oven. On the whole, the English loaf contains a trifle more flour than the Manitoban one, for, starting with equal weights, the Manitoban flour absorbs a little more water in making up the dough, and, consequently, makes one or two more loaves per sack of flour, but the difference only amounts to 2 or 3 per cent.

FIG. 1.

Pronounced as the differences are in the case shown, it must not be supposed that all foreign wheats are equally strong; this quality chiefly characterises those grown under the special climatic conditions prevailing on the great Continental plains: for example, the wheats of Kansas, Dakota, Manitoba, and the North-West of America, the wheats of Southern Russia and Roumania, some of the Argentine wheats, and those which come from the great Hungarian Plain. On the contrary, Indian wheats, Australian, and those derived from the Pacific slope of North America, like Walla Walla wheat, are no stronger than

the ordinary run of English wheats. Among English wheats, again, marked differences of strength exist; before the influx of foreign sorts the millers made considerable differences in the prices they would give for certain kinds, differences which no longer maintain now that there is available so much foreign wheat of an altogether stronger type. In consequence, these better English wheats are largely tending to go out of cultivation in favour of the varieties giving the largest yield; none of the best of the old kinds, such as Rough Chaff (Essex White, Taunton Buff, Old Hoary), Red Lammas, Chiddam, give on the average such good crops of grain and straw as does the old Rivett or the newer Square Head and Stand Up types. It may be mentioned here that with the modern roller-mill, red or white wheat will make equally white flour, so that there is no longer any difference of quality on that score.

The existence of differences of quality permanently associated with particular English varieties is a matter of considerable importance, as showing that climate is not the only factor in producing "strength," but that "strength" is also a congenital property in the wheat, subject to variation in seedlings, and therefore capable of improvement at the hands of the breeder.

In the last hundred years or more this quality of strength in the wheat has been associated with the nitrogenous or glutinous matter in the flour; we find, for example, Davy, in his lectures to the Board of Agriculture in 1812, saying:

"I have found 100 parts of good full-grained wheat sown in autumn to afford—of starch 77, gluten 19; 100 parts of wheat sown in spring—of starch 70, gluten 24. I have examined different specimens of North-American wheat, and all of them have contained rather more gluten than the British. In general, the wheat of warmer climates abounds more in gluten."

The method used by Davy to obtain gluten by kneading up a given weight of flour with water, enclosing it in a fine cloth, and then kneading gently in water until no more starch could be washed away, has remained in use as a method of testing flour until the present day. The results, however, cannot be entirely trusted; not only do many abnormal cases occur, but the quality of the gluten itself, its tenacity and, as we shall see

later, its power of resisting the action of the ferments of bread making, are factors in determining the strength of the flour just as much as its quantity.

More systematic examination of the wheat proteids has been undertaken by Ritthausen, Martin, Osborne and Voorhees, O'Brien, and others, but it cannot be said that the results so far obtained are very consistent in themselves or discriminate clearly between the very complex series of bodies which appear to be present. For practical purposes, however, attention has been concentrated on two of these proteids, gliadin and glutenin, which together, according to Osborne, make up the gluten. Gliadin is a sticky substance soluble in 70 per cent. alcohol, and recoverable on evaporation in thin flakes like gelatin ; glutenin is the tough basis of the gluten, and is insoluble in water, alcohol, and salt solutions, but is soluble in dilute alkali. Girard and Fleurent claimed that the character of the gluten for bread-making purposes was determined by the ratio the gliadin bore to the glutenin, and when estimating the gliadin by using a weak alcoholic solution of potash, they stated that good gluten should consist of about 75 per cent. of gliadin and 25 per cent. glutenin. Guthrie in New South Wales and Snyder in Minnesota also determined the gliadin-glutenin ratio for a large number of flours of known strength, and the opinion became generally accepted that in this way a measure could be obtained of the strength of flour. For example, in the Minnesota Agricultural Experiment Station Bulletin No. 63, 1899, Snyder states: "A well-balanced gluten is composed approximately of 65 per cent. gliadin and 35 per cent. glutenin. The gliadin-glutenin ratio in the different grades of flour made from the same wheat varies from 27 to 75 in the 'red dog' to 63 to 35 in the highest 'patent.' The lower grades of flour contain appreciably more protein than the higher grades, but the gliadin and glutenin in the lower grades are not present in the right proportions to form a well-balanced gluten capable of expansion and able to produce bread of the best physical properties." It should be added that the difference between the ratios suggested by Fleurent and by Snyder is mainly due to the fact that Snyder uses alcohol only and not alcoholic potash for the estimation of gliadin. Many experimenters, however, refused

to admit the correctness of these deductions on the ground that gliadin and glutenin did not possess any real individuality, but were products split off from the general mass of the wheat proteids according to the method of preparation employed. Kjeldahl, for example, showed that the amount of "gliadin" obtainable from flour varied with the strength of the alcohol employed, and Kosutany failed to obtain any consistent agreement between the baking trials of various flours and the gliadin-glutenin ratio as determined in the laboratory. Even the results quoted by Snyder in the Minnesota bulletin above mentioned do not all bear out the conclusions he drew from them.

For the purposes of the Committee of the National Association of Millers, which began its work for the improvement of the strength of English wheat in 1902, it was desirable to obtain not only as much information as possible as to the causes of strength but also a laboratory method for its determination on a small sample of wheat. Although the conversion of a given wheat into flour and afterwards baking it, forms the only ultimate test of its strength, it is obviously impossible to subject any large number of samples to such an examination every season. Yet if satisfactory results are to be obtained by cross-breeding, it will be necessary to subject great numbers of seedlings to selection, and the earlier the stage in their propagation this can be done the more can be passed under review. If every variety has to be grown on until it yields a bushel or so of grain for grinding, much more time and space would be required than if the test can be applied to a handful only of grain. What is wanted, then, is some laboratory test applicable to an ounce or two of wheat, which, though not final, would enable the experimenter to make a first selection and reject nine-tenths of his seedlings as showing no improvement on the current varieties. A large number of samples of wheat were being grown for the Committee, and were to be ground and baked separately, so it was decided at the same time to subject them all to chemical examination. In addition to the determination of gluten and of total nitrogen in the flour, determinations were made of the gliadin, the nitrogenous material soluble in water both directly and after fifteen hours' digestion with water

in an incubator, and also the nitrogenous matter soluble in a 3 per cent. solution of common salt, which represents approximately the strength of the salt solution formed in the dough during the bread-making process. Latterly, also, determinations of the phosphoric acid and other salts going into solution were made, so much do the physical properties and reactions of the proteids vary with the presence or absence of small quantities of mineral matters.

The importance of the determination of the nitrogen soluble in water after fifteen hours' digestion lies in the fact that in many samples of flour enzymes are present which in that time are capable of effecting much change in the proteids, a change which must go on during the ordinary process of bread making while the dough is standing.

The following tables give a selection from the results obtained in 1902 and 1903. The "bakers' marks" which are set out in the last column of each table give the strength of the flour as estimated by a practical baker who spends his whole time in making baking tests of flour and allotting marks to them on an arbitrary scale representing his own judgment. Obviously, they are only approximate figures, but to keep them as truly comparative as possible a particular mixture of average English wheat was kept and baked as a standard for comparison with each of the trial bakings, the standard being always marked at 60, and the others judged from that basis. Of course, the baker makes not a single loaf, but a small batch each time, and forms his opinion from the whole series. By way of check, also, the same flour was repeatedly baked (in no case did the man making the tests know the name or origin of the flour he was handling), and gave each time sensibly identical results, so that the figures may be taken to indicate with fair accuracy the "strength" of the flour from the practical man's point of view.

Table I. deals with samples of two kinds of wheat—Red Lammas and Square Head's Master—grown on seven different soils, but from the same lot of seed, in 1902. These wheats were selected because Old Red Lammas has the reputation of being one of the strongest English wheats, while Square Head's Master represents perhaps the most widely grown and heaviest yielding modern English wheat. The trial thoroughly con-

firmed the general opinion ; in six of the seven centres Square Head's Master yielded the bigger crop and stood up better, but from the miller's point of view it was never so strong a wheat as the Red Lammas grown on the same land. Although one sample of Square Head's Master (King's Lynn) was actually stronger than three of the samples of Red Lammas, yet at any one place the Red Lammas was always the stronger of the two, its average mark being 61 as against 46 for the Square Head's Master.

The second table deals only with imported wheats examined for the sake of comparison ; these, with the exception of the Calcutta Club wheat, were of great strength.

The third table deals with various English wheats ; the fourth with wheats of foreign origin, but grown for one or two years in England. Tables V. and VI. deal with the wheats from the experiment plots at Rothamsted and Woburn respectively, where the land had been subject to different systems of manuring for a very long period.

Table VIII. gives some of the results obtained in 1903 on the same class of flours.

It should be remembered that in both years the harvest was won under exceptionally unfavourable conditions, nor were the conditions uniform—ripening, as the wheats did, at different times in the different places. In 1902 particularly, many of the wheats were sprouted and out of condition, so that the experiments cannot always be trusted to determine the point at issue. However, in each case it is the same material which was baked and put through the chemical examination, so that the material is necessarily true enough as a means of correlating "strength" and chemical composition.

Turning to the results as a whole, they cannot be said to afford any means of solving the problem of measuring the "strength" of a sample of flour by chemical means ; they do not, indeed, represent any advance on the old well-known fact that in a general sort of way the strength of the flour is correlated with the amount of nitrogenous material present. But this correlation is only approximate and true for an average of samples, often failing entirely when applied to individual cases.

These negative conclusions become most apparent when the

results are treated graphically; the following series of curves deal only with the figures of Table VIII. for wheats grown in 1903.

The diagram (Fig. 2) shows a comparison between the bakers' marks, the total nitrogen and the gluten for the 1903 wheats; one division of the vertical scale indicates ten bakers' marks, 0·2 per cent. of nitrogen and 1 per cent. of gluten respectively. The positions representing each constituent in the various flours have been joined to form a curve for the assistance of the eye.

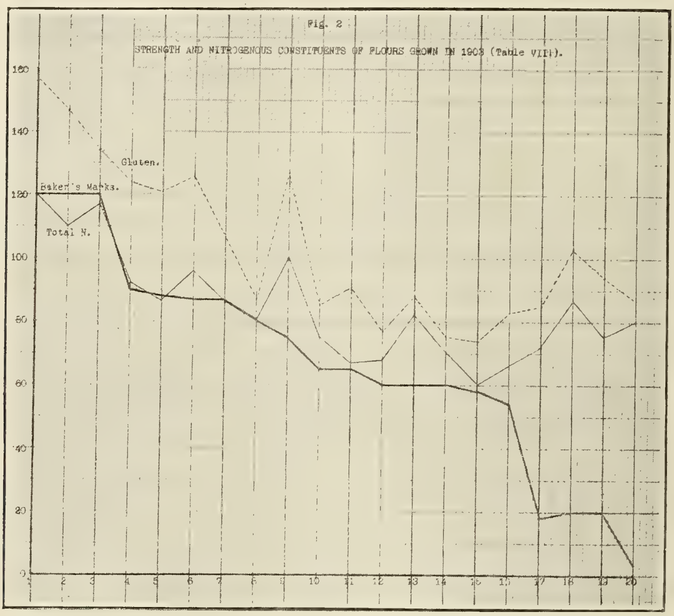

FIG. 2.

It is apparent that there is a very fair parallelism between the amount of nitrogen in the flour and the gluten obtained on washing, and that, roughly, these two curves have the same general trend as the curve showing the bakers' marks for strength. One notable exception occurs in the Red Fife (No. 9) grown at Addlestone as a spring wheat, which, with the highest nitrogen and gluten content of any of the English wheats of 1903, is yet inferior in strength to several of the other English wheats grown from foreign seed. Pilgrim's Prolific (No. 13), again, possesses a nitrogen content and yields an amount of gluten

quite disproportionate to its strength. Lastly, the four wheats grown at Rothamsted (Nos. 17–20), though rich in nitrogen and yielding a fair amount of gluten, were of the poorest quality, especially that from Plot No. 10, to which only a nominal mark could be attached. Reference to this plot will be made later. The second set of curves (Fig. 3) shows the relationship between the bakers' marks, as before, the percentage of gliadin in the flour, and the proportion the nitrogen as gliadin bears to the

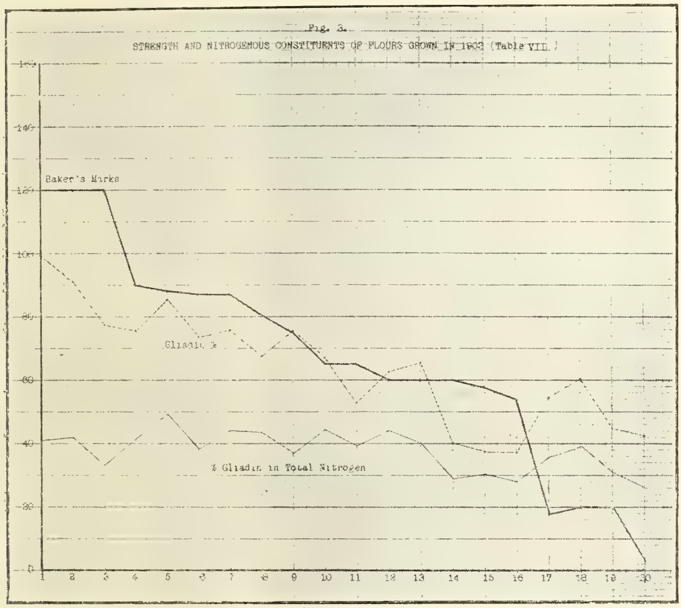

FIG. 3.

total nitrogen of the flour, *i.e.*, the gliadin-glutenin ratio of Snyder's tables.

Here again, while there is evidently some correlation between the amount of gliadin and the strength of the flour, the agreement is only general, and is contradicted in individual cases, especially with the samples grown at Rothamsted, as in the previous figure. The ratio of the gliadin to the gluten is clearly of the most irregular description, and no particular ratio can be selected as more indicative of a good gluten than any other. The purely negative character of the gliadin-glutenin figures here indicated is entirely borne out by the other figures given

for the flours grown in 1902, both for those of foreign origin and in fine condition as well as those derived from English wheats.

The only other figure worth a little attention is the rise in the nitrogenous material soluble in water after fifteen hours' digestion. This figure will be noticed to vary very much ; as a rule the rise is not great, but occasionally it is enormous, especially in the 1902 samples, when the rise due to digestion often amounted to two or three times the original amount. This great change was found to be associated with "sprout"; and incipient "sprout," hardly to be detected on an examination of the grain, is plainly seen in the rise of the water-soluble nitrogenous material after digestion. Doubtless with the free development of ferments which takes place both at the scutellum and under the aleurone layer of a cereal seed during germination, some of the proteolytic enzyme finds its way into the body of the endosperm, and so appears in the flour. As "sprout" means a great loss of strength, this figure affords one useful factor in estimating the baking value of a sample of flour.

It is plain that much has yet to be learnt about the normal constituents of the wheat grain before we shall be in a position to say what constitutes "strength" in a sample of flour, or how it can be estimated by other than practical methods. How complex the problem is may be judged from one or two facts that have appeared in the course of the experiments. Examples were found of a fact known to skilful millers, viz., that a blend of different wheats will sometimes give stronger flour than either of them separately. The photograph (Fig. 4) illustrates such a case. Nos. 1 and 2 represent loaves baked from particular flours ; No. 3 represents the loaf made from a mixture of 80 per cent. of No. 1 and 20 per cent. of No. 2 ; No. 4 representing a loaf made from the strongest Manitoban wheat for comparison. Various blends were tried, but only the proportions indicated gave the best results. In view of such cases, it is clear that the factor in the flour controlling strength is not a simple additive function, so that the strength varies with the amount present, but either there are two or more factors which must exist in a particular ratio to give optimum results, or else reactions take place between the flours, resulting in

something of the nature of a combination rather than a mixture pure and simple.

Other evidence points to the necessity for looking at the flour from this point of view; for example, it is a generally received opinion that wheat cut green is "stronger" than if it is allowed to get dead ripe. The Rivett wheat grown in 1902

FIG. 4.

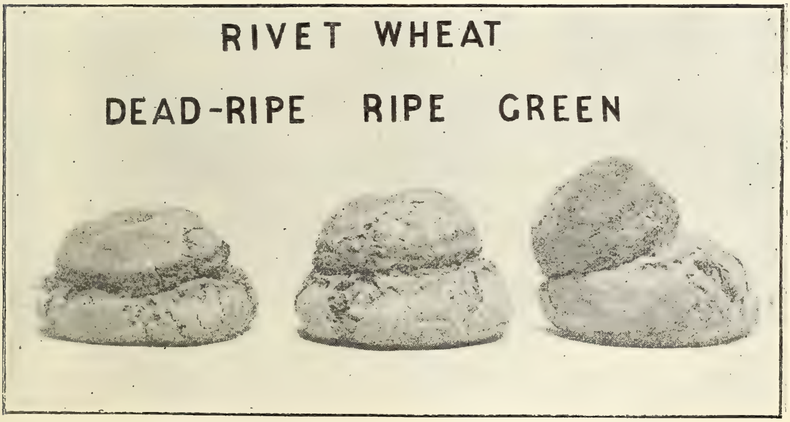

FIG. 5.

(Table III.) bore out this opinion, as may be seen from the photograph (Fig. 5). However, when the experiment of cutting at various stages was repeated in 1903, both at Addlestone and at Rothamsted (see Table VIII.), no such result was obtained, a result which we can at present only attribute to the very different weather which prevailed at and about harvest in the two years.

Again, as we have seen, "strength" is generally associated with a high nitrogen content, yet the wheats grown on some of the Rothamsted plots, where so large an excess of nitrogenous manure is applied that even the grain becomes more nitrogenous, instead of becoming stronger only get incredibly weak. The photograph (Fig. 6) illustrates such a case, showing a comparison of the wheat from the unmanured Plot 3 with 1·23 per cent. of nitrogen in the flour, and the wheat from the Plot 2 that is dunged every year, which yields flour containing 1·69 per cent. of nitrogen, the standard English mixture being set alongside for comparison. Again, Plot 10, at Rothamsted,

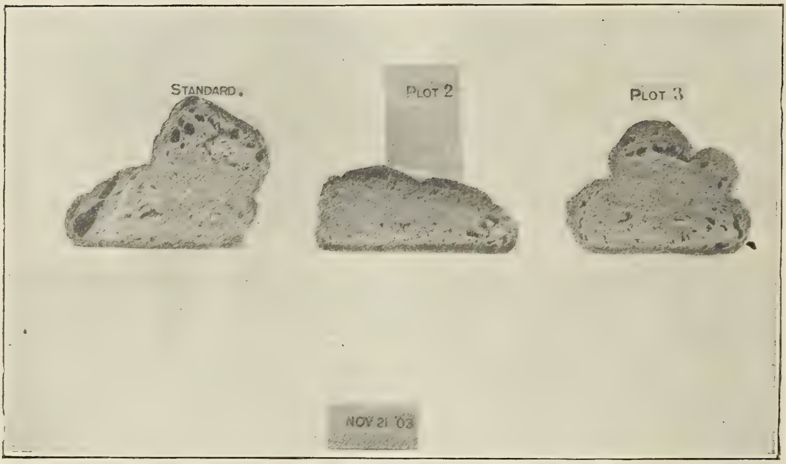

FIG. 6.

manured with ammonium salts only, yields wheat of a high nitrogen content and possessing all the external characteristics of a very "strong" wheat, so that it regularly has been set down as much superior to the others by the professional valuers who have examined the Rothamsted wheats. On baking it was found, both in 1902 and in 1903, the weakest of all, in spite of the fact that in both cases it had been harvested in better condition than the others. During the current season it happened that the flour from this plot was baked several times at regular intervals, and it was found to be steadily improving, rising, in fact, from a merely nominal mark in November up to a mark of 40 or 50 in June. The flour from the unmanured plot, tried at

the same time, showed no such improvement. All this goes to show that the nitrogenous constituents which had reached the grain at harvest time were not in a state to confer strength in the flour, but underwent some such gradual change during storage as takes place more definitely and rapidly under the climatic conditions prevailing where the strong wheats are grown.

Although the main problem of the cause of "strength" is still unsolved, it is clear that for the purposes of a selecting test among a number of new varieties, grown side by side, it will be sufficient to determine the total nitrogen. The total nitrogen, as we have seen, fails to measure "strength" in any absolute sense, but when wheats are grown under the same conditions, the order of their nitrogen content will be the order of their strength, or very nearly so. At any rate, it will be quite possible to discriminate between the really strong wheats and those which show no advance on the varieties commonly grown, and the determination of total nitrogen can be rapidly made on quite a small quantity of grain. It will not even be necessary to grind the wheat into flour, as a fairly constant relation appears to exist between the nitrogen content of the grain and of the flour resulting from it as long as one is dealing with wheats growing under similar conditions. Table VII. shows a series of comparative analyses of the whole grain and of the flour derived from it.

In this way the immediate object of the investigation from the agricultural point of view has been attained; it has become clear from the field experiments that no wheat exists at present which satisfies the millers' requirements for strength, and yet yields as well as the standard English varieties. But as "strength" proves also to be congenital in certain varieties of wheat, it is evident that new varieties can be bred both for "strength" and yield combined, provided enough seedlings are tried and selection is based upon "strength" as well as upon yield. In such a selecting test a determination of the total nitrogen in the grain, as compared with that present in the grain of some standard variety grown under the same conditions, will be found both convenient and accurate enough for a first approximation.

A. D. HALL.

The Roshamsted Experimental Station.

Comparisons of Red Lammas and Square Head's Master grown in various places—1902 crop.

Name of Flour.	Locality.	Soil.	Dry Matter.	Total Nitrogen.	Dry Gluten.	Water Sol. 1 hour N.	Water Sol. 16 hours N.	Alcohol Sol. Gliadin. N.	Per cent. W. S. in T. N.	Per cent. Gliadin in T. N.	Per cent. Rise of W. S.	Bakers' Marks.
Red Lammas	King's Lynn	Warp	84·21	1·74	13·46	·212	·361	·730	20·7	41·9	70·2	70
	Chislet ...	Deep Loam ...	84·49	1·57	10·04	·200	·360	·610	23·3	38·8	80·0	65
	Ely	Fen	84·50	1·71	11·17	·221	·298	·610	17·4	35·6	34·9	65
	Addlestone ...	Sand	84·32	1·32	8·18	·200	·472	·528	35·7	40·0	136·0	62
	Teynham ...	Deep Loam ...	87·28*	1·61	10·82	·221	·249	·728	15·4	45·2	12·7	58
	Wye... ...	Thin Chalky Loam	86·86*	1·26	8·07	·204	·225	·521	17·8	41·3	10·3	57
	Colchester ...	Stony Clay ...	84·79	1·36	8·17	·102	·291	·509	21·4	37·4	185·0	50
		Mean ...	85·21	1·51	9·99	·194	·322	·605	21·7	40·0	75·6	61
Square Head's Master	King's Lynn	Warp	84·64	1·66	11·73	·201	·467	·714	28·1	43·0	132·3	62
	Addlestone ...	Sand	87·45*	1·35	6·00	·228	·357	·567	26·4	42·0	56·6	55
	Ely	Fen	84·71	1·24	11·54	·211	·408	·556	32·9	44·9	95·5	55
	Teynham ...	Deep Loam ...	87·50*	1·46	9·81	·195	·286	·664	19·6	45·5	46·7	42
	Chislet ...	Deep Loam ...	85·35	1·97	15·44	·230	·401	·783	20·9	39·7	74·3	40
	Colchester ...	Stony Clay ...	84·62	1·31	7·71	·206	·352	·505	26·8	38·6	70·9	40
	Wye... ...	Thin Chalky Loam	87·46*	1·07	6·03	·183	·216	·463	20·2	43·3	18·0	30
		Mean ...	85·96	1·44	9·75	·208	·355	·607	24·9	42·4	70·6	46

* These flours were kept considerably longer before analysis.

TABLE II.—FLOURS FROM IMPORTED WHEATS.—1902 Crop.

Hard Kansas	N. America (winter)	88·10	1·92	11·97	·218	·270	·882	12·45	45·94	28·4	90
Odessa Ouika	Russia	88·60	2·21	15·63	·249	·322	1·044	11·27	47·24	29·3	92
Calcutta No. 2 Club	India	87·92	1·56	9·98	·223	·239	·754	14·30	48·34	7·2	60
No. 1 Northern Duluth ...	N. America (spring)	86·98	2·00	13·90	·225	·261	·886	11·25	44·30	16·0	90
Old Manitoba...	Ditto ...	87·38	2·06	13·30	·275	·277	·920	13·35	44·66	·7	120
Rosario Santa Fe	Argentine ...	87·63	2·22	14·26	·265	·242	·983	11·94	44·23	9·5*	75
Star of England Plate ...	Ditto ...	87·47	1·69	11·34	·200	·268	·814	11·73	47·07	8·4	82
Iron Duke (Imported Flour)	North America ...	88·33	2·31	15·00	·298	·420	·958	12·90	41·48	39·3	100
Duluth Imperial do.	Ditto ...	88·50	2·25	15·52	·244	·387	·991	10·85	44·04	58·6	100

* Fall.

TABLE III.—MISCELLANEOUS FROM ENGLISH WHEATS.—1902 Crop.

Hen Gymro	Wales	84·19	1·58	8·07	·183	·414	·398	26·1	25·2	126·2	55
Garton's New Era	(From Garton's)...	84·83	1·92	13·23	·232	·566	·556	29·5	29·0	144·0	59
Red Lammas (4 years' ley) ...	Addlestone ...	84·08	1·45	9·68	·197	·587	·440	40·6	30·4	198·0	60
Rivett (cut green)	Staines	85·10	1·66	9·08	·241	·298	·413	17·9	24·9	23·6	52
Do. (cut ripe)	Ditto	84·88	1·16	5·43	·201	·293	·316	25·3	27·2	45·8	35
Do. (cut dead ripe) ...	Wye	85·56	1·05	2·21	·235	·333	·246	31·7	23·4	41·7	15
Average English	Surrey	85·45	1·28	9·90	·143	·372	·507	29·1	39·7	160·1	60

TABLE IV.—FLOURS FROM FOREIGN SEED GROWN IN ENGLAND.—1902 Crop.

Red Fife	Wye	86·30	2·01	12·50	·235	·826	·410	41·09	20·4	251·7	80
Percy	Ditto ...	85·25	2·10	14·03	·256	·645	·463	30·71	22·0	128·7	80
Preston	Ditto ...	85·06	1·96	12·10	·178	·744	·434	37·96	22·2	318·	80
Kansas, 2nd year in England	Addlestone, Surrey	85·87	1·89	11·52	·219	·584	·717	30·90	38·0	166·7	75
No. 1 Northern Duluth do. ...	Ditto ...	85·73	1·67	9·34	·224	·447	·634	27·36	38·0	99·5	70
Russian, 1st year in England	Ditto ...	85·26	1·73	11·74	·162	·320	·693	18·49	40·0	97·6	72

TABLE V.—FLOURS FROM WHEATS GROWN AT ROTHAMSTED.—1902 Crop.

Plot 2b	Dung	83·90	1·69	9·53	·241	·784	·399	46·4	23·6	225·0	—*
3 & 4	Unmanured	84·32	1·23	7·39	·190	·385	·316	31·3	25·7	102·6	42
5	Minerals	85·14	1·35	8·85	·194	·559	·369	41·4	27·4	188·0	40
6	Minerals and 43 lb. Nitrogen as Ammonia	84·40	1·33	8·44	·218	·627	·387	46·1	29·1	187·6	—*
7	Minerals and 86 lb. Nitrogen	84·67	1·47	9·69	·225	·794	·475	54·	32·3	252·9	—*
8	Minerals and 129 lb. Nitrogen	85·70	1·53	9·31	·260	·634	·504	41·4	32·9	143·8	—*
10	Ammonia = 86 lb. Nitrogen	84·64	1·47	10·06	·237	·500	·475	34·	32·3	111·	1
11	Ammonia and Super.	85·67	1·42	9·70	·221	·418	·512	29·4	36·1	89·1	25
12	Do. do. and Sulph. Sod. ...	85·66	1·38	8·76	·209	·535	·511	39·7	37·0	156·	5
13	As 11 and Sulph. Potash...	86·07	1·41	8·79	·232	·796	·475	56·4	33·7	243·1	—*

Variety—Square Head's Master.

* These flours not good enough to bake alone, being sprouted and out of condition.

TABLE VI.—FLOURS FROM WHEATS ("WHITE MONARCH") GROWN ON THE R.A.S.E. FARM, WOBURN.—1902 Crop.

Plot.	Manures Applied	Dry Matter.	Total Nitrogen.	Dry Gluten.	Water Sol. N. 1 hour.	Water Sol. N. 16 hours.	Alcohol Sol. Gliadin.	Per cent. W. S. in T. N.	Per cent. Gliadin in T. N.	Per cent. Rise of W. S.	Bakers' Marks.
Plot 1	Unmanured	86·86	1·55	6·70	·244	·282	·67	18·2	43·2	15·6	These flours were not fit for baking alone. Nos. 5 and 6 were the worst.
3	Nitrate of Soda = 50 lb. Ammonia ...	86·75	1·86	9·42	·284	·317	·829	17·0	44·6	11·6	
4	Minerals only	86·60	1·68	8·71	·254	·284	·732	16·9	43·6	11·8	
5	Minerals and Ammonia = 50 lb. Amm.	87·06	1·91	10·39	·268	·336	·864	17·6	45·2	25·4	
6	Minerals and Nitrate = 50 lb. Amm. ...	87·25	1·66	8·06	·256	·315	·756	19·0	45·5	23·1	
7	Unmanured	87·29	1·58	8·60	·238	·322	·717	20·4	45·4	35·3	
9*a*	Min., and Nitrate every other year; not this	86·88	1·67	8·26	·258	·338	·662	20·2	39·6	31·0	
9*b*	Min., and Nitrate this and alternate years	86·90	1·81	8·83	·277	·359	·742	19·8	41·0	29·6	
11*b*	Dung = 200 lb. Ammonia	86·96	1·78	9·35	·298	·385	·802	21·6	45·0	29·2	

TABLE VII.—COMPARISON OF WHOLE GRAIN AND FLOUR.—1903.

Name.		Total Nitrogen.	Water Soluble Nitrogen 1 hour.	Water Soluble Nitrogen 16 hours.	Salt Soluble Nitrogen.	Gliadin Nitrogen.	Water Soluble P_2O_5.	Change in Total Nitrogen Wheat to Flour.
Broadbalk, 10	Flour ...	1·607	·245	·318	·309	·424	·040	83
Ditto	Wheat ...	1·945	·286	·348	·539	·491	·135	100
Northern Duluth, 3rd year	Flour ...	1·834	·240	·329	·348	·758	·070	83
Ditto	Wheat ...	2·216	—	·445	·562	·533	·129	100
Carter's Stand Up (Devon)	Flour ...	1·345	·174	·210	·312	·528	·061	86
Ditto	Wheat ...	1·572	·222	·327	·422	·450	·114	100
Square Head's Master...	Flour ..	1·216	·201	·223	·287	·373	·057	73
Ditto	Wheat ...	1·660	·264	·322	·461	·500	·196	100
Rough Chaff	Flour ...	1·368	·178	·253	·300	·628	·047	82
Ditto	Wheat ...	1·675	·225	·261	·411	·445	·107	100

TABLE VIII.—NITROGENOUS CONSTITUENTS OF FLOUR.—1903 Crop.

No.	Name of Flour.	Locality.	Dry Matter.	Total Nitrogen.	Dry Gluten.	Water Sol. N. 1 hour.	Water Sol. N. 16 hrs.	Salt Sol. N. 16 hrs.	Alcohol Sol. N. (Gliadin).	Per cent. W. S. in T. N.	Per cent. Salt Sol. in T. N.	Per cent. Gliadin in T. N.	Per cent. Rise of W. S.	Bakers' Marks.
1	Melrose	American Flour	87·33	2·416	15·72	·266	·317	·397	·986	11·0	16·4	40·7	19·2	120
2	Luiworth	Ditto ...	86·83	2·191	14·74	·260	·294	·390	·911	12·0	17·7	41·6	13·1	120
3	Hungarian No. 1 ...	Theis	86·62	2·335	13·41	·239	—	—	·777	10·7	—	33·2	—	120
4	Northern Duluth ...	Surrey (3rd year)	85·68	1·834	12·45	·240	·329	·348	·758	13·1	19·0	41·4	32·9	90
5	Red Fife	Wye	—	1·74	12·1	·213	·258	·340	·854	14·8	19·5	49·1	21·1	88
6	Ditto (autumn) ...	Woburn ...	—	1·93	12·6	·233	·301	·397	·736	15·6	20·4	38·1	29·2	87
7	Ditto (spring) ...	Ditto ...	—	1·72	10·7	·243	·283	·389	·757	16·8	22·6	44·0	16·5	87
8	Garton's New Era...	Addlestone Surrey	86·27	1·555	8·75	·204	·286	·305	·675	16·6	19·6	43·4	40·0	80
9	Red Fife (spring) ...	Ditto ...	—	2·05	12·7	·262	·301	·418	·755	14·7	20·4	36·8	14·9	75
10	Ditto (autumn) ...	Killerton, Devon	86·18	1·502	8·54	·251	·299	·288	·665	16·7	19·1	44·2	19·1	65
11	Carter's Stand Up ...	Ditto ...	86·37	1·345	9·07	·174	·210	·312	·528	13·0	23·2	39·4	20·7	65
12	Rough Chaff ...	Hants	87·23	1·368	7·73	·178	·253	·300	·628	13·0	21·9	43·9	42·1	60
13	Pilgrim's Prolific ...	Warwickshire...	86·06	1·637	8·80	·239	·291	·320	·656	14·2	19·5	40·0	21·7	60
14	Square Head's Master (cut green)	Addlestone, Surrey	86·69	1·388	7·50	·231	·250	·301	·401	16·6	21·6	28·7	10·8	60
15	Ditto (cut ripe) ...	Ditto ...	86·58	1·216	7·38	·201	·223	·287	·373	16·5	23·5	30·5	11·1	58
16	Ditto (cut dead ripe)	Ditto ...	86·58	1·317	8·33	·191	·238	·304	·372	14·5	23·0	28·1	12·5	54
17	Square Head's Master (cut green)	Rothamsted, Herts	86·08	1·445	8·52	·200	·329	·305	·545	13·9	21·1	37·7	64·5	18
18	Ditto (cut ripe) ...	Ditto ...	85·92	1·536	10·31	·205	·408	·298	·603	13·4	19·2	39·1	99·0	20
19	Ditto (cut dead ripe)	Ditto ...	85·97	1·457	9·40	·192	·388	·293	·450	13·4	20·1	30·7	102·0	20
20	Plot 10, Broadbalk Field	Ditto ...	86·50	1·607	8·67	·245	·318	·309	·424	14·9	19·2	26·2	29·8	3

AGRICULTURAL RETURNS OF 1904.

The preliminary statement giving the summaries of the results of the Agricultural Returns for 1904 in Great Britain, compiled from the schedules returned by occupiers of land and owners of live stock, was issued by the Board of Agriculture and Fisheries on August 26th. Information embodying similar particulars has been published by the Department of Agriculture and Technical Instruction for Ireland, for which country figures are accordingly given, along with the details for Great Britain, in the following tables.

The total area shewn as under crops and grass in Great Britain in 1904 was 32,323,176 acres, as compared with 32,343,579 acres in 1903. In Ireland the corresponding acreage also fell off, viz., from 15,242,421 to 15,224,816 acres. The broad changes may be shewn in the following summaries of the distribution of the crops in each year :—

Crop.	Great Britain.		Ireland.	
	1904.	1903.	1904.	1903.
	Acres.	Acres.	Acres.	Acres.
Cereal Crops	6,953,051	7,060,543	1,279,143	1,306,345
Other Crops...	3,162,365	3,189,589	1,094,576	1,104,468
Clover and Rotation Grass	4,671,269	4,807,826	1,279,988	1,236,035
Bare Fallow...	432,690	351,126	10,388	9,722
Permanent Grass	17,103,801	16,934,495	11,560,721	11,585,851
Total	32,323,579	32,343,579	15,224,816	15,242,421

The decline in the area under cereal crops in Great Britain is thus 107,492 acres, in that of other crops 27,224 acres, and in clover and rotation grasses 136,557 acres ; while, on the other hand, permanent grass has again increased. The increase of 81,564 acres, or 23 per cent., under bare fallow, which may probably be ascribed to the unfavourable conditions of the autumn of 1903, brings the acreage thus left uncropped to practically the same figure as in 1896. Ireland, likewise, shews decreases in cereal and other crops, but an increase of 43,953 acres in clover and rotation grasses and a decrease of 25,130 acres in permanent pasture.

Considering the cereal crops individually, it will be noted that there is a diminution of 206,303 acres, or 13 per cent., in the area under wheat, a decrease doubtless due also mainly to the exceptionally wet autumn. The area under this cereal—1,375,284 acres—is thus the smallest ever recorded in Great Britain, being 42,199 acres less than in 1895, and as much as 727,000 acres less than in so recent a year as 1898. It may be noted, moreover, that one acre out of three then under wheat has now been devoted to some other use. There is also a small decline of 1 per cent. in barley, which, however, is sufficient to bring the acreage under this crop below the 1,903,666 acres of 1898, hitherto the lowest returned. The area under oats, on the other hand, continues the upward movement that has characterised it for several years past, the only occasions when the acreage under this grain was greater than in 1904 being 1894 and 1895. In Ireland the decrease in the area under wheat, viz., 6,368 acres, is proportionately even greater than in Great Britain, amounting to 17 per cent., and it is there accompanied by a falling off of 18,672 acres in oats. The details of the cereal crops are given in the following table:—

Crop.	Great Britain.		Ireland.	
	1904.	1903	1904.	1903.
	Acres.	Acres.	Acres.	Acres.
Wheat	1,375,284	1,581,587	31,228	37,596
Barley and Bere	1,840,688	1,858,484	157,563	158,791
Oats	3,252,975	3,140,242	1,078,866	1,097,538
Rye	55,714	59,064	9,413	10,050
Beans	252,782	239,655	1,889	2,080
Peas	175,608	181,511	184	290
Total Cereals ...	6,953,051	7,060,543	1,279,143	1,306,345

Among other crops in Great Britain potatoes, turnips and swedes, and small fruit alone shew any increase, amounting in the case of the latter to 2·4 per cent. The largest decrease occurs in the small area under flax, which again falls by 39 per cent., while there are reductions of 19·1 per cent. in the case of kohl-rabi and 11·5 per cent. in the case of vetches. Lucerne,

which has increased year by year of late, shews a loss of 7·7 per cent. in 1904.

Crop.	Great Britain.		Ireland.	
	1904.	1903.	1904.	1903.
	Acres.	Acres.	Acres.	Acres.
Potatoes	570,209	564,286	618,460	620,393
Turnips and Swedes ...	1,604,103	1,603,301	285,740	287,548
Mangold	398,827	401,627	75,759	75,998
Cabbage	64,627	64,803	39,652	44,545
Rape...	97,772	99,004	3,473	3,772
Vetches	128,229	144,966	2,760	2,662
Flax	563	925	44,292	44,685
Hops...	47,799	47,938	—	—
Kohl-Rabi	15,607	19,297		
Lucerne	55,706	60,355	24,440	24,865
Other Crops...	100,971	106,935		
Small Fruit	77,952	76,152	10,388	9,722
Bare Fallow...	432,690	351,126		

Of the area under hay, 89,656 acres, or 3·7 per cent. less than in 1903, were cut from clover and rotation grasses. In the permanent grass so utilised there appears an increase of 10,500 acres. In the case of grass not cut for hay, on the other hand, the clover and rotation grasses have fallen by only 46,901 acres, and the permanent pasture has increased by 158,806 acres. In Ireland the area under hay, whether from temporary or permanent grass, shews an increase. Clover and rotation grasses not for hay also shew an increase, but permanent pasture not for hay shews a falling off of 55,829 acres.

Crop.	Great Britain.		Ireland.	
	1904.	1903.	1904.	1903.
	Acres.	Acres.	Acres.	Acres.
Clover and Rotation Grass (for hay)	2,322,789	2,412,445	631,509	627,259
Ditto (not for hay)	2,348.480	2,395,381	648,479	608,776
Total	4,671,269	4,807,826	1,279.988	1,236,035
Permanent Grass (for hay)	4,765,470	4,754,970	1,627,605	1,596,906
Ditto (not for hay)... ...	12,338,331	12,179,525	9,933,116	9,988,945
Total	17,103,801	16,934,495	11,560,721	11,585,851

Turning now to live stock, the number of horses returned shews an increase of 1·5 per cent., chiefly among the unbroken horses. The total number is the largest that has ever figured in the Returns.

Horses.	Great Britain.		Ireland.	
	1904.	1903.	1904.	1903.
	Number.	Number.	Number.	Number.
Horses used for Agricultural Purposes	1,120,247	1,106,448	369,785	364,639
Unbroken Horses (one year and above)	301,371	297,121	93,498	89,327
Ditto (under one year) ...	138,618	133,585	68,980	69,856
Total	1,560,236	1,537,154	532,263	523,822

The number of cattle in Great Britain is, with the exception of 1892—when 6,944,783 were returned—the highest total recorded. Only one class shews a decline, viz., cattle of two years and above. In the younger classes increases of 4½ per cent. are shewn. The number of cows and heifers in milk or in calf—2,678,680—exhibits an increase of 3½ per cent., and is the largest ever noted in these Returns. The total increase in cattle, as compared with 1903, amounts to 155,734, or 2·3 per cent. Irish cattle shew an increase of 13,020.

Cattle.	Great Britain.		Ireland.	
	1904.	1903.	1904.	1903.
	Number.	Number.	Number.	Number.
Cows and Heifers in Milk or in Calf	2,678,680	2,588,208	1,497,819	1,495,179
Other Cattle (two years and above)	1,374,636	1,430,625	1,026,665	1,032,178
Ditto (one year and under two)	1,429,833	1,368,136	1,035,505	1,036,253
Ditto (under one year) ...	1,377,203	1,317,649	1,117,143	1,100,502
Total	6,860,352	6,704,618	4,677,132	4,664,112

Ewes kept for breeding show a slight increase, but other sheep continue the almost progressive decrease that has now been noted for several years past. The total fall in the year

is 432,623, or 1·6 per cent. Irish sheep have also declined by 116,720, or 3·0 per cent.

Sheep.	Great Britain.		Ireland.	
	1904.	1903.	1904.	1903.
	Number.	Number.	Number.	Number.
Ewes kept for Breeding ...	9,880,908	9,879,101	1,524,803	1,576,179
Other Sheep (one year and above)	5,313,602	5,459,889	722,565	729,501
Ditto (under one year) ...	10,012,664	10,300,807	1,580,516	1,638,924
Total	25,207,174	25,639,797	3,827,884	3,944,604

Pigs, like cattle, shew a large increase in Great Britain, amounting to 175,083, or 6·5 per cent., although the sows kept for breeding exhibit a decline of 2 per cent. In Ireland all classes of pigs declined, the total reduction being nearly 5 per cent.

Pigs.	Great Britain.		Ireland.	
	1904.	1903.	1904.	1903.
	Number.	Number.	Number.	Number.
Sows kept for Breeding ...	382,056	389,900	133,541	147,807
Other Pigs	2,479,588	2,296,661	1,181,982	1,235,709
Total	2,861,644	2,686,561	1,315,523	1,383,516

WHEAT GROWING IN ARGENTINA.

The Argentine Republic, though still far behind the United States, may now be regarded as competing for the second place as a contributor to the wheat supply of this country. The quantity received annually, on the average of the past five years, has been 574,000 tons, compared with 2,960,000 tons from the United States, 520,000 tons from Canada, and 335,000 tons from Russia. In the first seven months of the present year, moreover, the total import of Argentine wheat has exceeded that from any

other country, outstripping, probably for the first time, the combined receipts from the North American continent. Fifteen years ago the Republic had hardly become a competitor in this trade, and although the progress since 1894 has not been so rapid as it was a few years earlier, the great possibilities of development which the country undoubtedly presents makes the question of Argentine agriculture one of considerable interest to the British wheat grower. The actual area devoted to the crop, according to the official figures for 1903–4, was 10,485,000 acres, which may be compared with the area of 5,063,000 acres returned by the Census in 1895. The preliminary estimate of this year's production from the above area was 3,700,000 tons. An interesting feature in connection with the development of the wheat area, and one which has in the past, to a certain extent, restrained the increase in the acreage, is the change which is taking place in the centre of production. Much of the land which has been, and still is, cultivated for wheat, lies in the northern part of Santa Fé, in a region liable to drought and excessive heat. Experience, however, has shown that the best wheat land lies rather to the south and south-west, in the province of Buenos Ayres, and in the more southern portions of Santa Fé and Cordoba; the extension in this direction has recently been very marked.

The areas devoted to wheat in the four principal provinces of Argentina during the past six years are shown in the following table (in thousands):—

Year.	Santa Fé.	Buenos Ayres.	Cordoba.	Entre Rios.
	Acres.	Acres.	Acres.	Acres.
1898–1899	3,581	1,929	1,410	583
1899–1900	3,690	2,045	1,381	707
1900–1901	3,663	2,265	1,548	695
1901–1902	3,417	2,403	1,440	695
1902–1903	3,106	3,249	1.893	650
1903–1904	3,314	4,061	2,329	521

It will be seen from this that while the area devoted to wheat in Buenos Ayres increased from 1,929,000 acres in 1898–99 to 4,061,000 acres in 1903–4, the area in Santa Fé declined over a quarter of a million acres in the same period.

The yield of wheat is much better in Buenos Ayres than in

the other provinces, as will be seen from the following average yields, estimated by the Argentine Department of Agriculture :—

	Bushels per Acre.
Sante Fé, north and centre	10·63
Sante Fé, south	13·24
Cordoba, south	13·01
Entre Rios	12·03
Buenos Ayres, north	14·98
,, ,, centre	17·68
,, ,, south	20·26

In 1901–1902 an average yield of 15 bushels was obtained in Buenos Ayres, whereas the other three provinces were so affected by the drought that a yield of only 5 bushels was obtained in Santa Fé, $3\frac{2}{3}$ bushels in Cordoba, and less than 7 bushels in Entre Rios.

A question of considerable economic importance is the cost at which wheat can be grown under the conditions prevalent in the Argentine and placed on the markets of this country. In an early number of this *Journal* (December, 1894), various estimates made at that time by competent authorities were quoted, and several similar calculations are contained in a Report* recently issued by the United States Department of Agriculture.

The writer of this Report observes that the difficult feature of the study of wheat production in Argentina is to tell what it costs. Some idea of the average value of farm land and rent may be obtained, but wages fluctuate so much, and different farmers, with different ideas and under different conditions, give such widely varying estimates of the amount of labour required, that a satisfactory estimate cannot be made. The cost of the labour necessary to produce wheat in Argentina is still more difficult to estimate, because three-fourths of it is performed by members of the farmers' families, young and old, of both sexes. Three estimates, however, are given in the following table of the cost of producing one acre of wheat. The first (A) is the estimate of M. Tidblom, Director of Agriculture and Animal Industry; the second (B) is an estimate prepared by M. Lahitte, Director of Statistics in the Ministry of Agriculture; and the third (C) is a statement by Mr. Glynne Williams, an English *estanciero* in the province of Buenos Ayres, of the actual cost of

* "Wheat Production and Farm Life in Argentina," by Frank W. Bicknell, United States Department of Agriculture. Division of Statistics, Bulletin No. 27.

producing the crop on 3,678 acres in 1902-3. In the first of these estimates the work is, presumably, chiefly or entirely performed by the farmer and his family, whilst in the other two labour is allowed for.

COST OF PRODUCING ONE ACRE OF WHEAT.

	A	B	C
Quantity produced, in bushels	18	22	16
	s. d.	s. d.	s. d.
Ploughing, harrowing, rolling, and sowing	3 2½	4 7½	7 6 (Ploughing and Seed)
Seed	3 3	3 2½	
Harvesting and stacking	3 4½	5 11	8 10
Thrashing	7 3½	10 5	9 4 (Thrashing and Bags)
Bags	2 6	2 10½	
Hauling to railway station	0 11	3 9½	3 7½
	20 6½	30 10	29 3½

The above figures are exclusive in each case of rent or interest on value of land. Rent in Buenos Ayres is said to range from 1s. 8d. to 16s. per acre, but Mr. Bicknell states that, from his own observation, the best wheat land is let at from 2s. 11d. to 8s. 4d. per acre, except that near the city of Buenos Ayres. A minimum sum, therefore, of 3s. must be added to the above items, so that the cost would seem to range from 23s. 6d. to 33s. 10d. per acre. In the first estimate (A), however, there is probably no allowance for the farmer's own labour or cost of living, while in the second (B) the production is above the average. In the third of these estimates, which represents the actual ascertained cost over a considerable area, the rent is stated to be 2s. 11½d. per acre, and the cost of raising an acre of wheat, including all expenses, as 34s. 6½d., or almost 2s. 2d. per bushel. This, however, was in a somewhat unfavourable season. In the previous year a yield of 20½ bushels was obtained at a cost of 36s. 2d. per acre, so that the cost was 1s. 9½d. per bushel.

Comparing these figures with those which appeared in this *Journal* in 1894, it would seem that there has been some advance in the cost of production since that year, as it was then estimated that, making every allowance for rent, living, interest on capital, and depreciation, the cost, assuming a production of

15 bushels, would represent an outlay of from 21s. to 25s. per acre. Mr. Gastrell, at that time H.M. Vice-Consul at Buenos Ayres, stated that the cost appeared to be about 21s. per acre, while several authorities quoted by him placed the cost at from 13s. 4d. to 17s. 6d., exclusive of rent, cost of living, and interest on capital. It must be remembered that about three-fourths of the wheat raised in Argentina is grown by people of the class who depend on family labour, colonists from Italy, Spain, Russia, and other countries in Continental Europe, and that their standard of living is very low. In the opinion of many observers the profits of this class of Argentine farmer merely represent the privations and low order of living which he endures. The other 25 per cent. is grown on large farms, frequently owned by Englishmen, where the work is usually done by contract and hired labourers are more generally employed. The farm referred to above, owned by Mr. Wynne, is an example of the latter class.

About 35 per cent. of the farms in the four provinces are farmed by the owners, 50 per cent. by ordinary tenants, and 15 per cent. by tenants on a share system, known as the *medianero* system. The tenant on this system starts with a capital of a few pounds, and it is usually easy to find a land-owner who will give him land, a mud hut to live in, horses, bullocks, implements, and seed to start farming on his own account. He and his family prepare the land, sow and harvest the wheat, and it is sold by the landowner at his discretion. After deducting the cost of the bags, binding-twine, and thrashing, as well as the seed, the proceeds are divided between the tenant and the owner, usually in equal proportions.

There are three principal varieties of wheat grown for export, the Barletta, the Russian, and the Hungarian. The Barletta is an Italian variety, closely resembling American red hard wheat, though not so hard. It is the favourite sort in all parts of the country, and has shown its superior adaptability to various Argentine conditions through many years. Millers in Argentina and in Europe prefer Barletta, though they often mix French with it to give it colour. An analysis made in 1891 showed 17·07 per cent of gluten. It is a heavy wheat, and a sample shown at Buenos Ayres in 1903 weighed 66·19 lb. per

bushel. The Russian is next in popularity, and gives from $60\frac{1}{2}$ to $65\frac{1}{4}$ lb. per bushel. The Hungarian is of more recent cultivation.

After the wheat leaves the farm it meets with many difficulties, such as bad roads, absence of warehouses or elevators, shortage of railway cars, and inadequate facilities at the shipping ports, which tend to reduce the price paid to the farmer for his wheat. The storage of the grain at the stations pending loading into the cars has recently been dealt with by a law passed on September 17th, 1903, which requires that all railway stations in agricultural districts shall be provided with free storage for all cereals offered for shipment. Up to the present the wheat has been stacked in great piles of bags, and it is generally sold to some regular buyer for cash at the station. The shelters which are now to be provided have to be of sufficient capacity to protect all cereals delivered for transport from the inclemency of the weather and the damp from the ground. The Government will fix the minimum capacity of each shelter, and the railways are not to make any charge for this service. The date for the fulfilment of this regulation expired in May last, and, if it has been complied with, the cereals will have safe shelter where they can wait till such time as trucks are available.

The question of the alleged shortage of railway trucks has recently been the subject of a Report by M. Lahitte, the Director of Statistics of the Department of Agriculture, and he observes with regard to the provision of shelters that " if consignors do not find their demands acceded to in the matter of quick despatch they will, at least, have assured to them the preservation of their produce." With regard to the provision of railway trucks, the lack of facilities at the ports leads to the slow discharge and consequent delay in the return of the cars. Large elevators, however, are now being built at Buenos Ayres which enable the loading to be done much more rapidly ; at Bahia Blanca also, the only ocean seaport, the railway company which controls the port is now building elevators and making extensive improvements. The cost of transport on the Argentine railways was, according to the official statistics, 6s. 8d. per ton per 100 miles, but in this connection reference

may be made to a previous article in this *Journal** on the transportation of wheat in Argentina.

The actual railway rates in the province of Buenos Ayres charged between some of the principal inland stations and the ports of Rosario, Buenos Ayres, and Bahia Blanca, ranged from 2½d. to 4¾d. per bushel; that is, roughly, from 7s. 9d. to 14s. 8d. per ton, while from certain places in the other provinces the cost would be considerably greater.

Importation of Fodder into Norway.

The Board are informed by H.M. Consul-General at Christiania that in consequence of the unexpected deficiency of fodder in the coming season in Norway, the Agricultural Department has decided to partly relax the restrictions on the importation of straw, hay, &c., to Norway, from countries other than Sweden and Denmark. In cases where satisfactory proof can be produced from the local veterinary or police authorities, and attested by the Norwegian Consul at the port of shipment, that the fodder comes from a district which for the whole year last past has been free from infectious cattle diseases, such as pleuro-pneumonia, foot-and-mouth, anthrax, and the like, the Department of Agriculture are prepared to consider applications for permission to land single cargoes of fodder. Hay must be carried direct to Norway from the port of shipment, and applications for leave to import must in each case be made in advance.

Recent Experiments in Soil Inoculation.

A few years ago much interest was excited in this and other countries by the announcement that the scientific discoveries of Hellriegel and Wilfarth had received commercial application, and that the organisms of the nodules of the roots of *Leguminosæ* could be purchased in a form convenient for artificial inoculation. The specific cultures placed upon the market were largely tested practically and experimentally, but the results were such as to convince even the patentees, Nobbe and Hiltner, that the problem which promised so much for agriculture had not been satisfactorily solved. Since that

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* Vol. II., March, 1896, p. 413; Vol. X., June, 1903, p. 91.

time, however, investigators have not been idle, and the present position of the subject is to be found in a recent report by Hiltner and Störmer.*

It was early recognised that the organisms (bacteria) which inhabited the root-nodules of the various species of *Leguminosæ* were not all alike, and that, in fact, they showed marked physiological if not morphological distinctions. Any particular species of leguminous plant is found to resist more or less successfully the attempt of these various organisms to effect an entrance into its root-hairs, and according to the power of the organism to gain access, and to establish colonies, so is the particular plant benefited and the stock of fixed nitrogen increased. This power of adaptability of the organism is designated its "virulence," a term, however, which is perhaps hardly suited to our English mode of expression, though it may for the present be retained. It has been found that organisms of what is called "high virulence" are capable of entering with ease the root-hairs of vigorous plants at an early stage of their growth, and of inducing the formation of nodules that are large, numerous, and placed high up on the roots. Organisms of low virulence, on the other hand, can only enter plants of feebler growth, or plants that have passed the most vigorous stage of youth, so that the nodules, in this case, are small and scarce, and distributed, for the most part, near the ends of the roots. The practical object, therefore, would appear to be the breeding of strains or varieties of organisms of high virulence, adapted to the symbiotic requirements of the various important species of farm and garden leguminous crops.

The nitragin put on the market a few years ago was used in two ways, being either applied directly to the fields, or mixed with water and brought into contact with the seed before sowing. Under the former method of procedure an increase of crop was obtained only when the nitragin was used on land containing much humus. The explanation given for failure under other conditions was that the bacteria artificially introduced perished for want of food before the leguminous seed germinated and produced plants.

* "Bericht über neue Untersuchungen über die Wurzelknöllchen der Leguminosen und deren Erreger," *Arbeiten aus der Biol. Abteil. für Land-und Forstwirtschaft am K. Gesundheitsamte*, Band iii. Heft 3.

Failure of the nitragin to effect an improvement in the crop when it was sprinkled on the seed is now believed to be due to the action of secretions produced by the seed in the early stages of germination. These secretions are found to be rich in salts of potash, and when brought into contact with the bacteria in question they induce changes allied to plasmolysis, and these changes are subsequently followed by death. This difficulty was found to be got over by moistening the seed and allowing it to sprout before the nitragin was applied; but manifestly such a procedure would always be difficult, and often impossible, to carry out in practice. The object, however, would appear to have been gained in another way, namely, by cultivating the bacteria in a medium that imparts to them the necessary power of resistance. Such nourishment may take various forms, but that which gave the best results consisted of a mixture of skim milk, grape sugar, and pepton, and it is in this medium that the organisms of the nitragin now distributed are cultivated.

During the past year more than 400 experiments were carried out in different parts of Germany with pure cultures prepared at the Agricultural Institute at Munich; 98 of them were carried out in Bavaria, and from a recent report by Dr. Hiltner* it appears that the results were, on the whole, exceedingly favourable; of the whole number in only nine cases was the inoculation without result, though in eight others it is described as indecisive. The number and result of experiments with each kind of plant were as follows:—

——	No. of Experiments.	Favourable.	Without Result.	Undecided.
Serradella	23	21	1	1
Yellow lupins	23	20	2	1
Mixed leguminous plants	15	14	—	1
Vetches	13	11	1	1
Blue lupins	5	3	—	2
Peas	5	3	2	—
Red clover	4	1	1	2
Trifolium incarnatum ...	2	2	—	—
Lucerne	2	1	1	—
Horse beans	3	2	1	—
Other leguminous plants	3	3	—	—
	98	81	9	8

* *Naturwissenschaftliche Zeitschrift für Land-und Forstwirtschaft*, March, 1904.

The results were particularly satisfactory in the case of lupins and serradella, the difference in the crops being in many cases very marked indeed ; for instance, lupins grown on adjoining plots were found to give when inoculated a crop six times as large, and even greater differences were obtained in some other cases. On some soils crops were obtained by the use of these pure cultures, whereas repeated attempts in the past had given such unsatisfactory results that it was concluded that these plants could not thrive on land of this description. The results of the inoculation experiments have shown this conclusion to be erroneous, and the farmers anticipate that by this system they will be able to practice green manuring, and thus be successful in improving certain areas of poor land in Bavaria. In the case of the other plants which are usually cultivated in Bavaria the inoculation has also in most cases resulted in an increased yield.

Early in the present year the new nitragin was being offered free of cost to all members of the German Agricultural Society on the condition that it was used in accordance with the directions that accompany it. In consequence of the large demand the free offer was in April withdrawn, but the substance may be purchased from Professor Hiltner, of Munich, in quantities sufficient to treat the seed of a half to one acre at the price of one shilling.

Model Allotments.

A system of model allotments for the purpose of providing instruction in the best methods of cultivation has been adopted by the Oxford and Surrey County Councils. In Oxford the plan pursued is to rent a plot in an allotment, and to place it in charge of a steward, who is responsible for its proper cultivation, under the supervision of the County Horticultural Instructor. The plot is then cultivated in the best manner possible, and a large variety of vegetables grown upon it, thus affording an object lesson to the cultivators of the adjoining plots. At the end

of the year an exhibition is held of the produce for the different trial allotments, and prizes are awarded for good cultivation. The best cultivator receives a county shield, which he holds until the next year.

In Surrey the county model allotment scheme has only been recently started. Four allotments have been selected on Lord Onslow's estate, and are now being cultivated by the tenants, under the advice of the County Horticultural Instructor and his assistant. The tenants supply the labour and the tools and receive the produce of the allotment, whilst the county authorities supply the seeds, manures, and instruction. The arrangements were not completed till the end of March last, too late for proper trenching, but a satisfactory start has been made at three centres, and the fourth will, it is hoped, be much improved before the end of the year. In a Report on these allotments in July last, the County Horticultural Instructor observes that in horticulture, as in agriculture, land that has been insufficiently worked and run down in fertility cannot be restored in one year or two; it can be improved, and with timely attention in carrying out essential details and proper feeding, it can in no great length of time be made to yield luxuriant crops. This has been demonstrated on numbers of plots in Surrey, and similar results are expected in those instructional allotments instituted by Lord Onslow.

The Cabbage-Root Fly.
(*Phorbia brassicæ.*)

This fly, whose maggots are a grievous pest on cabbages and allied crop plants, both here and in other European countries, as well as in the United States and Canada, belongs to the family *Anthomyidæ*, a very large family of flies the members of which may easily be mistaken for house flies. There is a great deal of confusion as to the identity of this fly; the attacks of other root-eating flies have been attributed to it, just as the damage done by the cabbage-root maggot has been ascribed to its relations.

Professor M. V. Slingerland has done very much to dispel this confusion*, both by making clear points in the biology and showing how the pest may be combated with reasonable chances of success.

The adult fly measures about $\frac{1}{4}$ in. long, and there are differences between the sexes. The male is dark ash grey, and has three dark stripes on the upper surface of the thorax ; a similar black stripe runs down the abdomen, each segment of which has also a narrow transverse black stripe. The body generally is distinctly bristly. The eyes almost meet on the top of the head. The legs are black and bristly, and as a characteristic each hind femur (thigh) has at its base a tuft of bristles. The female fly is paler in colour ; the dark stripes are fainter or absent ; the eyes do not occupy so much of the head there being a distinct space between them ; the abdomen is pointed.

The egg is very small but visible to the naked eye, whitish in colour, and narrow oval in shape. The larvæ or maggots are white or whitish-yellow and legless ; the head end is pointed, and has two dark curved mouth hooks ; the hind end is truncate, and the last segment carries on its middle two dark spiracles ; all round the edge of this last segment are twelve little projections, which can be seen on examination with a good lens, the two lowest being larger, and forked, this latter peculiarity being characteristic of the species. When full grown the maggot measures $\frac{1}{4}$ in. ; it becomes a pupa under cover of its last moulted skin, the puparium or case being light or dark brown in colour and oval in shape.

The females lay their eggs close to the plant, choosing, it may be, a crack in the soil by which they can get below the surface, so that the eggs may be laid as close to the plant as possible. In a week or more, according to the weather, the eggs are hatched, and the maggots first of all gnaw the external layers of the young roots, and then make and occupy galleries in the cortex of the main root. Sometimes the lower part of the stem is invaded, in which case the pith is tunnelled. The maggots have been taken tunnelling in the leaf stalks of

* Bull. 78, Nov., 1894. Cornell Univ. Exp. Station. "The Cabbage Root Maggot," by M. V. Slingerland.

the swede. When full grown the larva passes into the soil a little away from the attacked plant, and becomes a pupa, or pupation may take place in the infested plant. The first flies of the year appear for their egg-laying towards the end of April and in May, and there are probably three generations in the year.

Attacked plants have their growth checked, their leaves discolour, wither, and wilt, infested parts become slimy, rotting takes place, and the plant falls away.

Phorbia brassicæ is an enemy to plants belonging to the natural order *Cruciferæ*, although there is an American record of the maggots mining the leaves of beet. The maggot has also been found at work on cauliflower, turnip and swede; cauliflowers in garden cultivation have been attacked, while brussels-sprouts grown alongside and planted at the same time were unharmed. Attacks have also been recorded on broccoli, the radish, and the garden stock; and Slingerland found the maggots at work on such common cruciferous weeds as shepherd's purse, winter cress or yellow rocket, and hedge mustard.

Preventive and Remedial Measures.

1. Very early sown plants are noticed largely to escape; but temperature seems to be the important factor in this connection; early setting out, however, is not always practicable, and even early planted cabbages may not escape attack.

2. Protecting the cabbages and cauliflowers by means of tarred paper or cards is a preventive measure which has been tried in America. The protection by this method was successful with 7,000 plants in one case and with 10,000 in another. Slingerland satisfied himself by experiment of its great usefulness, the flies not being able to get near enough the protected plants for their egg-laying; presumably maggots from any eggs laid beyond the extent of the card are unable to reach the plants. The cards used are six-sided, about three inches across, with a slit reaching to the centre where there is a star-shaped cut to fit well round any thickness of stem. The cards should be placed round the plants at the time of transplanting or setting out. To place the card in position,

bend it slightly to open the slit, then slip it on to the centre, the stem entering the slit, after which spread the card out flat and press the points, formed by the star-shaped cut, round the stem. A tool has been devised to cut these cards so that five to six hundred can be cut in an hour. The card must be put on carefully so as to lie on and prevent the fly from creeping under to lay her eggs.

3. In garden cultivation, a cupful of paraffin may be added to a pailful of sand, and the sand sprinkled once a week round the stems of cabbages. This would act as a deterrent to the fly in her egg-laying.

4. In cultivation on a small scale, picking the maggots by hand from the plants, which have been taken up for the moment for the purpose, can be practised.

5. Badly infested plants should be removed and burnt, the stumps being uprooted and burnt after attack so as to keep down the pest.

6. Slingerland mentions carbolic acid emulsion and bisulphide of carbon as successful insecticides for destroying the eggs, or killing the maggots, once they have got to work. The formula for the carbolic acid emulsion is 1 lb. of hard soap or 1 qt. of soft soap, dissolved in 1 gall. of boiling water, into which 1 pt. of crude carbolic acid is poured. Stir well till an emulsion is formed. For use, dilute with thirty equal parts of water. This may be put on the plants so as to reach the eggs or maggots.

In the treatment with bisulphide of carbon (its fumes are poisonous, and no light must be brought near the substance) a little of it is injected into the soil near the plants, care being taken that the liquid does not touch the roots. The vapour diffuses through the soil and quickly kills the maggots.

7. Where the attack has been bad, neither cabbages or beet should immediately follow, nor any cruciferous crop. Whatever rotation of crop be practised to evade the pest it must be accompanied with the destruction of cruciferous weeds which play the part of nurseries for the cabbage maggot.

Improvement of Stock in Northumberland.

The system adopted by the Northumberland Agricultural Society for the improvement of live stock in the county has been the subject of favourable comment from time to time in various agricultural journals. The following account of the system, which has been supplied to the Board by Mr. W. J. Bolam, Secretary of the Society, may be of interest.

At the beginning of 1898 what is known as the Society's Bull Scheme was inaugurated, and a grant of £300 was made from the funds of the Society for the purpose of carrying it on, a further grant of £200 being made in 1902. Briefly, the working of the system is as follows:—

The bulls are purchased by the Society, who place them with farmers in certain districts where it is considered their services are required, the farmer or keeper agreeing to keep the animal in good condition and to deliver it up when required. For his trouble he retains all fees received for service, which are as follows:—

	£	s	d.
Members of the Society	0	4	0
Non-members	0	10	0
Agricultural Occupiers whose annual rental does not exceed £50, Hinds or Shepherds	0	4	0

The number of cows that may be served by any of the bulls is limited to seventy in any one year, not more than eight of which may be the property of one owner, the object being, of course, to spread the good effect as widely as possible. No cow may be served which has been served by any other bull within six weeks previously. The bulls are annually inspected and reported upon to the Council of the Society.

In all, twenty-three pedigree Shorthorn bulls have been purchased in connection with the scheme at a total cost of £689 18s. 10d., and of these twenty have been resold for £406 13s 2d., leaving in hand three bulls worth, say £60 = £466 13s. 2d.; showing a net expenditure by the Society of £223 5s. 8d. This is no doubt a very considerable sum of money, but in the opinion of those well able to judge the Society is more than compensated for the outlay by the

improvement of the stock in the various districts where the bulls have been stationed.

Up to the end of last year 1,599 cows had been served, or an average of 265 per season, from which it will be seen that advantage has been largely taken of the arrangement.

The Society cannot, of course, afford to pay high prices for the bulls, but most of them have been very useful animals of good pedigree. They have been purchased from the following well-known herds :—Sir James Miller, Bart., Manderston; Mr. G. Harrison, Gainford Hall, Darlington; Mr. W. Bell, Ratcheugh, Alnwick; Mrs. A. H. Browne, Callaly Castle, Whittingham (whose herd was sold off a few years ago); Sir Walter Thorburn, Orchard Mains, Innerleithen; Mr. John Robson, Newton, Bellingham; Mr. A. F. Nichol, Bradford, Belford; Mr. J. S. Shield, Sourhope, Kelso; between £40 and £50 being the highest price paid, whilst the average figure has been £30.

An altogether different method has been employed for the improvement of farm horses. As there were already a number of horse clubs and cart horse societies doing excellent work in the county, the Council of the Society decided to assist them by subsidies, thereby enabling them to obtain better stallions, and in some instances to extend their districts. In several cases the subsidy received has been the means of enabling the clubs to keep going. Since the year 1900 approximately £350 has been apportioned in this way with very good results, there being a marked improvement in the quality of young stock at the local and county shows. Too little attention, however, is paid by the average farmer to the class of mare from which he breeds, but where the dam has been of good size and quality the fact of the owner being able to put her to an undoubtedly good horse has naturally resulted in many good foals being produced, good prices being obtained for many of them as yearlings and two-year-olds.

Speaking generally, it is safe to assert that a great deal of good has resulted from the efforts of the Society to improve the class of stock in the manner indicated above, and it should not be forgotten that it has been done on a comparatively small income, with a membership varying between 500 and 600, and a sub-

scription list of about £650. Bearing this in mind, it is wonderful that the Council should have been able to carry out these important schemes without outside assistance, and with no hope whatever of making any direct profit from them, but rather the certainty of incurring a very considerable expenditure of money. The system would appear to be one that might with advantage be followed by other agricultural societies.

Report of Sheep-Dipping Committee.

The Departmental Committee appointed in April, 1903, by the Board of Agriculture and Fisheries to investigate experimentally, and to enquire into certain questions connected with the dipping and treatment of sheep, have now presented their Report. The Committee examined witnesses representative of the sheep-farming industry in this and other countries, and by permission of the Agricultural Department of the University College of North Wales they conducted three sets of experiments at Bangor with a large number of sheep-dips of representative types. By the courtesy of the officials of the Bradford Conditioning House an opportunity was afforded of testing the effect of these dips upon the condition, colour, and fibre of the wool. A summary of these experiments will be found in another part of this *Journal* (p. 361). The Committee do not recommend any special dip, as the evidence and the experiments both lead to the conclusion that the best representative dips of the types commonly used in the country are effective against the sheep-scab acari (*Psoroptes communis*), and, to a great extent, against keds (*Melophagus ovinus*), and are also advantageous for the general health of sheep.

The experiments conducted at Madryn showed that a single dipping, when carefully carried out, is sufficient to cure scab; and the Committee do not make any recommendation as to the interval between a first and second dipping, but where, as an additional safeguard, a second dipping is resorted to, they think that the evidence confirms the view previously held that it should take place between ten and fourteen days after the first dipping.

When two dippings are carried out at a less interval than fourteen days the experiments and evidence prove that arsenical dips should not be used on both occasions.

With regard to the legislative measures for dealing with sheep-scab, the Committee observe that the powers conferred by the Sheep Scab Order of 1898 are very wide, and can be worked very effectually; but, unfortunately, the local authorities, who are responsible for the efficient administration of the Order, are very diverse in their action and in the interest they take in the eradication of the disease. By the use of the powers of inspection conferred upon the Board of Agriculture in Section 2 of the Diseases of Animals Act, 1903, a more effective and zealous administration may be secured, and especially with regard to those provisions dealing with isolation of infected or suspected flocks, and the thorough disinfecting of infected premises or folds. The inspection by the central authority should also prove very beneficial in securing an exhaustive examination into the origin of every recorded outbreak of disease, and the actual source of the infection. At present the local authority has no power and seldom any desire to trace back the outbreak to any source beyond its own area.

Another subject referred to by the Committee is the dissatisfaction which prevails in different parts of the country with regard to the very stringent and diverse restrictions placed upon the movement of sheep into their respective areas by the local authorities. These restrictions act in a manner seriously prejudicial to the trade of sheep-farming, and in any new regulations which may be put in force the Committee suggest that uniformity of regulation should, as far as possible, be attained.

On the question of compulsory dipping the Committee state that, after consideration of the evidence from our own flock owners and from the Colonies, they have no hesitation in recommending that an annual dipping of all sheep within the United Kingdom should be made obligatory upon all flock-owners, and that this dipping should be carried out by the local authorities, acting under regulations approved by the Board of Agriculture and Fisheries and by the Department of Agriculture and Technical Instruction for Ireland. To carry out effectual universal dipping is, they observe, no light task; but it is the only

method of eradicating sheep-scab, whilst its effect generally upon the sheep of the country will be entirely beneficial.

To attain universal dipping two policies were put before the Committee, one by regulations of the central or local authority, the other by placing the entire responsibility upon the flock-owner, and by punishing with ever-increasing penalties every owner for having scab upon his premises, and for failing to cure it. This latter policy, undoubtedly, proved very effectual in the Colonies, especially in New Zealand ; but it would involve new legislation, it would be difficult to adapt to the varying conditions of sheep-farming in this country, and it would in our opinion be too drastic a measure to commend itself to flock-owners generally at the present time. The Committee have therefore adopted the alternative policy of regulation, and they suggest the lines upon which such regulations may be framed.

The Committee also suggest that the Board of Agriculture and Fisheries should establish a schedule of dips recognised as efficient. Makers of proprietary dips who desired to have their preparations placed in this schedule, or users of home-made dips who wished to ascertain whether their compounds would be approved, would then be required to submit samples for examination, for which examination a fee would be charged ; and, if satisfactory, the dips would be scheduled as such. To ensure that the dips actually used are not inferior to the samples approved, it should be competent for the inspector to take occasional samples of the dips in use and forward them to the Board of Agriculture for comparison with those originally submitted.

The Report is signed by all the members of the Committee except Sir H. H. Scott, who disagrees with the suggestions as to the steps to be taken to eradicate sheep-scab, and who submits an alternative scheme for compulsory dipping. Mr. M. Hedley, F.R.C.V.S., also dissociates himself from the recommendations in regard to compulsory dipping of all sheep, and thinks that the dipping should be limited to areas where sheep-scab is suspected or known to exist.

[*Cd.* 2258. *Price* 3*d.*]

Experiments in Dipping Sheep.

At the request of the Departmental Committee appointed by the Board of Agriculture to enquire into the dipping and treatment of sheep, Professor Winter carried out at the farm of the University College of North Wales, Bangor, a series of experiments to test the effects of various dips on the parasites which attack sheep, and also to determine the effect of the dips on wool. The experiments may be divided into three series.

In the first series of experiments the Committee proposed to use sixteen different preparations, representing well-known types of home-made and manufactured dips. One of these, a sulphur-magnesia compound, it was eventually found impossible to obtain, as it had ceased to be manufactured. The total number of different dips employed was, therefore, fifteen. These were tried during July and August, 1903, in order to determine their effect on keds (*Melophagus ovinus*).

This is probably the most widely distributed of the parasites which affect sheep. It is often erroneously called "the tick." The dips employed were, in many cases, proprietary preparations, and in order to avoid referring to the makers by name they are distinguished by numbers, as follows:—

I.—Arsenic and washing soda: 2½ lb. of arsenious acid and 1¾ lb. of ordinary washing soda per 100 gallons of dip-bath.

II.—Arsenic and caustic soda: 2½ lb. of arsenious acid and ½ lb. of good, dry caustic soda per 100 gallons of dip-bath.

III.—Arsenic, washing soda, and sulphur: The same as No. I., with the addition of 4 lb. of flowers o sulphur. In the second experiment 8 lb. of sulphur were used.

IV.—Arsenic and sulphur: A combination of arsenic and sulphur, containing 5 lb. of free sulphur per 100 gallons.

V.—Soluble sodium compounds of sulphur, together with sulphur in a free state.

VI.—A solution of calcium sulphide: Prepared by boiling together 25 lb. of sulphur, 12½ lb. of lime, and sufficient water until the solution was of a dark red-brown colour, straining and making up to 100 gallons of the dip-bath.

VII.—Sulphur magnesia: Not used.

VIII.—Carbolic acid: 1½ gallons of liquid carbolic acid (97 per cent. of real tar acid), 5 lb. of soft soap, to 100 gallons of water. In the second experiment only ¾ gallon of carbolic acid was used.

IX.—Mixed carbolic acid and arsenic: Equal parts of No. I. and No. VIII.

X.—Tar acid and other tar products.

XI.—Pitch oil: One part of soft soap, two parts of pitch oil, and to each gallon of this mixture 1 quart of seal or whale oil. One part of this complete mixture being used to thirty parts of water for the dip-bath.

XII.—Spirits of tar: 2 lb. of soft soap dissolved in a gallon of hot water, and well mixed with 1 gallon of spirits of tar, and added to 78 gallons of water.

XIII.—Tar acids with paraffin: Tar acid, 29 per cent.; tar oils (paraffin), 36 per cent.; lanoline, 8 per cent.; anhydrous soft soap, $17\frac{1}{2}$ per cent.; water, $9\frac{1}{2}$ per cent. One gallon of this mixture added to 100 gallons water.

XIV.—Tobacco and sulphur: Made by steeping 35 lb. of finely-ground tobacco in water for four days, with occasional stirring. The extract was then strained off, and added to 10 lb. of flowers of sulpur, and the bulk made up to 100 gallons.

XV.—Tobacco, sulphur, and tar acid.

XVI.—Tobacco mixed with soft soap and sulphur.

XVII.—Carbolic acid, sulphur, and powdered hellebore.

Except Nos. V. and VI., all the dips employed were effective in killing keds, but were less successful in their action on the puparia. In the second series of experiments No. VI. cured scab, but again failed to destroy keds. Generally speaking, the tar acid and crude tar products killed the keds almost immediately. The tobacco dips were nearly as active, while the sulphur and arsenic preparations required a little longer time.

As the puparia appear to hatch out about twenty-one days after being deposited by the female, a second dipping at the end of three weeks would doubtless have a marked effect in getting rid of keds. By that time the puparia left in the fleece after the first dipping would have hatched out, and as there is no evidence to show that keds produce puparia within three weeks after they are hatched, it would only be necessary for the second dipping to destroy the keds which had appeared since the previous dipping.

It is evident that where some of the poisonous dips are used, a second dipping after an interval of twelve days is injurious to the health of the sheep, so that where a second dipping is desired for the destruction of keds, the proper time would appear to be about three weeks after the first immersion.

The second series of experiments dealt more particularly with sheep-scab, but Dips II., V., IX., XI., XII., and XV. were omitted from this series, but No. XVII., given above, was used, for the first time. The sheep in this case were dipped twice. In the third series of experiments the sheep were only dipped once, and only four dips—Nos. IV., X., XIII., and XVI.—were used.

As regards sheep-scab, the experiments have shown conclusively that one dipping in a good dip is sufficient to effect a cure.

In the second series of experiments no traces of living acari were found after the first dipping, when effective dips were used. In the third series the sheep were only dipped once, and although they were allowed to run with other sheep, and were examined at intervals for ten weeks, no trace of scab was found.

Where a flock is attacked with scab, it is suggested that bad cases should be carefully examined, and that the dip should be well rubbed into all affected parts. This should not be done where arsenical preparations are used.

With regard to the dips employed in the experiments, Professor Winter considers Dip No. XVI. very satisfactory. It proved effective both in destroying keds and in curing scab. It is a fluid dip, mixes readily with cold water, leaves the wool in a beautiful condition, and has no injurious effect upon the sheep. Its present price is, however, almost prohibitive. The other tobacco preparations, although effective dips, appear to be rather more crude.

Tar acid (carbolic) dips are very effective in destroying both acari and keds, and, when skilfully prepared, leave the skin and wool in a nice condition. Unless the strength is carefully regulated they cause irritation to the sheep for some time after dipping. They have a marked effect in healing sores. Of those used, Nos. X. and XIII. were the best. Both are fluids and mix readily with cold water. No. X. discoloured the wool somewhat, and, when used in the summer, No. XIII. caused a certain amount of irritation to the sheep for some time after dipping. Apart from this, it is considered a very efficient dip. Dip No. VIII., of the strength used in the second series, proved to be fairly satisfactory. The other carbolic dips, Nos. XI., XII., and XVII. (used only in the second series), were crude preparations, inflicted pain on the sheep, and, although they were effective in destroying keds and (in the case of No. XVII., the only one tried) in curing scab, should not be employed.

The arsenic and sulphur dips are thoroughly effective in curing scab and destroying keds, but the experiments have

clearly proved that the use of strong dips of this character is attended with some danger when treating sheep affected with scab, particularly if they are in low condition or have sores on them. The sheep which died as a result of dipping in these preparations were undoubtedly low in condition, short of wool, and badly affected with scab. They were mountain sheep of the class among which sheep-scab is most frequently found. Owing to the conditions which prevail in the mountain districts, the sheep are often in a weak state during the winter months, and outbreaks of scab are more likely to be further advanced before they are discovered than is the case on lowland farms where effective supervision is more easily carried out.

In the course of the investigations it was found that some sheep which were being kept in covered shelters before being dipped improved in condition ; and Professor Winter observes that the reduction in the number of outbreaks of sheep-scab during the summer months is, probably, largely accounted for by the dry weather and the fact that food is then more plentiful than in winter.

Abnormalities in Dairy Produce.

A very large number and variety of bacteria exist in milk, primarily because it contains in a most suitable form the nutriment which they require. As with the higher forms of life, many of these organisms are uncommon, or peculiar to certain districts, and their influence in dairying has not yet been definitely ascertained. An enquiry regarding certain of these bodies was lately made by Mr. T. A. Coward, instructor in dairying to the North Riding County Council of Yorkshire, in connection with "faulty" dairy produce which he observed in certain farmhouses in his district in 1902–3.

In a sample of slimy or greasy cheese he found six organisms, and by experiment proved them to be connected with the "fault" which in its extreme form is known as the "slip-coat" of cheese. It occurs in Wensleydale and Stilton cheese, and causes considerable trouble and waste, as the gradual softening of the cheese—occasionally to the depth of an inch—produces an

adhesive layer, whereby the removal from the shelf is rendered difficult and breakage frequently results. Of the six bodies found by Mr. Coward two were moulds which made their appearance at an early stage when the cheese is "greasy" to handle but not very adhesive. One was a grey form of the common moulds which produce a dirty white growth on the surface of cream and on the exterior of cheese, or occasionally uniformly distributed throughout. These moulds are most conspicuous on cheese which is from ten to twenty days old; they vary from one to three inches in length, and are designated as "whiskers" by cheesemakers. They have also the effect of curdling milk and of producing disagreeable flavours which are objectionable in butter-making. They thrive especially in rooms which are cool, damp, dark, and badly ventilated, and their development is therefore primarily prevented by means of good ventilation, as well as by dryness and light, in the dairy.

Mr. Coward also found a chocolate-coloured mould which during the course of growth produces a mouldy odour with a suggestion of garlic. It adds to the colour of the slimy layer, and keeps it soft owing to the liquefying properties of the mould. It appears on cheese which is from two to three months old. Three micrococci (which are bodies still simpler than moulds) were also detected in slimy cheese. An orange-coloured one, producing an aroma, was found in the innermost layer of the slime; and another, which is greenish-yellow and of slow growth, forms a slimy jelly. The two bodies above-mentioned may appear concurrently during the first development stage, and they greatly add to the greasy character of the cheese. The other organisms were a third micrococcus, pink or flesh-coloured, of fairly rapid growth, producing very little odour; and a bacterium of slow growth, producing a brown colour. It was proved that the development of these two organisms is not prevented by borax, as in the case of moulds.

Mr. Coward states that the sequence in which the foregoing six organisms develop in cheese is probably as follows:—The grey mould appears first, and then the orange-coloured body, which together induce the first stage of the slimy coat when the cheese is "greasy" to the touch but not very adhesive. The greenish-yellow organism follows, and greatly adds to the

"greasy" character of the cheese; and when it is from four to eight weeks old the slimy layer becomes adhesive and reddish-brown, owing apparently to the pink micrococcus and brown bacterium. The chocolate-coloured mould finally appears, but it does not seem to have much effect on the colour or consistency of the slime layer.

The employment of borax in solution, or even in powder, is recommended to prevent the development of the dirty grey mould; and, to remove the slime caused by the colour-producing organisms, the application of small quantities of methylated spirits is advised. The slime is hardened by absolute alcohol, which also destroys injurious organisms; but it cannot be used for this purpose on account of its cost, and methylated spirits can be successfully employed as a substitute. Solutions stronger than 10 per cent. were proved to be quite effective when small quantities were applied to the exterior of the cheese. As already indicated, the development of the moulds can be checked by ventilation, temperature, and light.

There are, of course, various modifications of faulty cheese, and Mr. Coward made another investigation regarding the cause producing dirty or grey spots and a soapy flavour in a cheese. It was found to contain a small yeast-like organism, several types of acid-producing bacteria, a mould similar to the grey one already mentioned, and a putrefactive micrococcus. The two organisms last mentioned are supposed to be the cause of the "fault," and the origin of the putrefactive organism was apparently traced to a compound feeding-cake. It is supposed that the milk from which the cheese was made had been infected by particles of, or dust from, the feeding-stuff, and it is therefore advised that when compound feeding-cakes are fed to milch cows proper care should be taken to prevent such infection.

A sample of butter which had a tainted and almost fæcal flavour, as well as a sharp and penetrating aroma, was also examined. It contained a species of mould and two of yeasts (which were apparently innocuous), and three of bacteria which were the cause of the trouble. It was experimentally proved that two of these injurious organisms do not thrive in the presence of more than a trace of free acid, and that the other is frequently found in sour paste. The immediate and rapid

souring of the cream, and the means of preventing particles of flour and paste reaching the milk or cream during the process of bread-making, are therefore recommended whenever cases of tainted butter occur in the dairy.

A detailed account of these investigations has been published by the University of Leeds and the Yorkshire Council of Agricultural Education.

Dairy Factories in the United States.

The system of co-operation in agriculture which is gradually extending in the United Kingdom has existed for many years in various forms in certain Continental countries, notably in the Jura district of France and Switzerland, where co-operative cheese-making has been practised for several centuries. In the United States of America co-operation in dairying was first adopted about the year 1852, first in connection with cheese and then in the manufacture of butter, but its subsequent extension has been so great that the industry has been gradually transferred from the farm to the factory, and it is stated in a publication* recently issued by the Department of Agriculture at Washington that this economic result is one of the most striking features in the history of dairy farming in the United States during the past fifty years.

The cheese factories and butter factories or creameries were at first purely co-operative, but various other forms of ownership and management now exist, involving the co-operative principle in part, or being purely proprietary. Similarly, during the early period of the movement, butter and cheese were made in the factories at different seasons, or butter and skim-cheese at the same time. There is now a distinct separation in the trade, and a preference not to make cheese at the creameries. The creamery system was introduced about twenty years ago on what was known as the "cream-gathering" plan. The cream was separated on the farm by gravity or "setting," and collected

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* "Statistics of the Dairy" (see also *Journal of Board of Agriculture*, Vol. VII., p. 230).

by the agents of the factory. The introduction of the separator, however, revolutionised the system of management, and, although cream-gathering creameries have not ceased to exist, the milk itself is now generally sent to the central creamery or its branches, which are known as "separating stations." As a rule milk is tested and paid for on the basis of its fat content or butter-making value.

According to the Census taken in 1900, there were in that year in the United States 5,571 creameries, with 2,050 skimming stations and 69 other branches. The quantity of creamery butter produced was over 420,000,000 lb., of which 78·3 per cent. was packed in solid form and 21·7 per cent. in rolls. This distinction is due to market requirements and local custom. Butter at the New York market, for instance, is sold in firkins, tubs, or boxes, whereas it is generally sent in rolls to the Philadelphia markets. Creameries which are able to market butter in rolls generally benefit, for although extra labour is required and packages and railway charges cost more, the butter is more attractive, it brings a higher price, and can be sold more directly to the consumer, thereby saving the commissions of the middlemen. The average price obtained for all butter by the creameries in 1900 was very nearly 10d. per lb.; but whilst the average for butter in rolls was 11d., it was only 9·7d. for butter in the lump.

The creameries are stated to require on the average $22\frac{1}{2}$ lb. of milk, or its equivalent in cream, to make 1 lb. of commercial butter. New York appears to have the richest milk of any of the leading dairy States, its creameries making 1 lb. of butter from every 21 lb. of milk received. New Hampshire stands second, with a ratio of $21\frac{1}{4}$ lb. to 1 lb.; and California third, $21\frac{1}{2}$ lb. to 1 lb. Minnesota, Pennsylvania, and Wisconsin are alike, viz., 22 lb. as the average; then Illinois $22\frac{1}{4}$ lb., Kansas and Vermont $23\frac{1}{4}$ lb., and Iowa 24 lb. The ratio above-mentioned indicates that the milk sent to the creameries has an average of 3·81 per cent. of butter-fat, but for various reasons it is not regarded as absolutely accurate, and on the assumption that 23 lb. of milk are required to make 1 lb. of creamery butter, the average of butter-fat would be 3·7267 per cent. The sale of cream is a large and profitable business, and the total quantity

sold by the creameries in 1900 was 7,720,569 gallons, valued at an average price of 57 cents per gallon, *i.e.*, about 2s. 10d. in English measure. Skim-milk is mostly returned to the farmers at an average price of 11·23 cents per 100 lb. It is really worth twice as much when fed judiciously to young stock, but commercially it is worth less, and only about 10 cents per 100 lb. is paid by the creameries for its manufacture into casein. This comparatively new dairy industry has acquired some importance in the United States, where nearly 12,300,000 lb. were produced in 1900. It is made by coagulating by acid milk from which all the fat has been extracted by the separator, the whey is drawn off, and the acid washed from the curd or casein, which is then dried. The desiccated product has a commercial value of 3 to 5 cents per lb. It is used for making a glue employed for paper sizing, as a binder for cheap paint, a "filler" for dressing wood and heavy fabrics, and for various other purposes.

The cheese factories are managed like the creameries in many respects. Whole sweet milk is delivered every day, and it is made into cheese without delay. For about twenty years after these factories became numerous the cheese, although different in form, size, colour, and quality, was nearly all made upon the same general plan, closely resembling that of the English Cheddar. Hence a certain uniformity of type was established which became known as the "standard American" or "full-cream factory" cheese, also often called Cheddar. During the last ten or twenty years, however, various other kinds have been made, chiefly in imitation of popular foreign varieties. According to the Census returns there were 3,585 cheese factories in the United States in 1900, and they produced nearly 282,000,000 lb. of cheese, of which 20 per cent. were other than the American standard factory kind, viz., mainly the Swiss Gruyère or Emmenthaler, Limburg, Neuchatel, Brie, Camembert, and cream cheese. The value of cheese at the factory averaged nearly 9·5 cents a lb., and it was a little more for the standard variety than the average for all other kinds. The quantity of whey produced at the factories was over 209,000,000 lb., of which 21·9 per cent. was sold for the manufacture of milk-sugar. There are only three or four places in the United States where this article is made, and although

the amount produced is not accurately known, it is said to be larger than the total of any other country in the world. The condensed milk industry is also of considerable importance, and nearly 187,000,000 lb. were produced in 1900.

The aggregate production of butter in the United States in 1900 amounted to nearly 1,492,700,000 lb., of which 1,071,745,000 lb. were produced on farms, and the rest at creameries. It is estimated that 50,000,000 lb. which "escaped" the Census returns should be added to the total. During the decennial period ending in 1900 the produce of the creameries increased from 15·2 to 28·2 per cent. of the total quantity of butter made in the country, whilst the amount produced on the farms decreased from 81·8 to 71·8 per cent. This aggregate annual production of butter is at the rate of 502 lb. to every square mile of land area in the United States, exclusive of Alaska, and furnishes a supply of 19·57 lb. *per capita* of the population, being 14·06 lb. of farm dairy butter and 5·51 lb. of creamery butter. As regards cheese, 16,372,330 lb. were produced on farms in 1900, and 282,634,488 lb. at factories, the total representing a supply of 3·9 lb. per head of the population. The proportion made on the farms declined from 7·25 per cent. in 1890, to 5·5 per cent. in 1900. The remarkable transfer of the dairy industry in America from the farm to the factory has therefore been more marked with respect to cheese than in the case of butter, and the change appears moreover to be steadily increasing.

Testing Milk and Cream by the Babcock Method.

The centrifugal methods of analysis known as the Babcock, Gerber, and Leffmann-Beam tests are now largely used for commercial purposes in determining the percentage of fat in milk. Not only milk dealers, but creameries and butter factories conduct their business and settle accounts with their suppliers on the basis of quality as shown by one of the methods. With a view of ensuring the accuracy of the apparatus employed, the Board, as has been previously notified,*

* *Journal*, Vol. VII., p. 480, Mar., 1901. *Journal*, Vol. X., p. 259, Sept., 1903.

have made arrangements with the committee of the National Physical Laboratory for the examination and verification of the pipettes, measuring glasses, and test bottles used. It has been pointed out that there is some liability to error in reading the percentage of fat, depending on the point which is taken in the curved surface of the fat in the neck of the test bottle. If the lowest point of the curved surface is read, the amount of butter-fat is underestimated; if the upper surface is read, the estimate is too great; the error involved in this latter case is, however, at least twice as large as that caused by reading the lowest point of the curve. Thus, if the estimate from the lower reading is 3·30 per cent., and that from the upper reading 3·40 per cent., the true reading would be about 3·33 per cent. It has been found by experiment, however, that in consequence of the shortness of time during which the centrifugal motion is maintained in the Babcock apparatus the total quantity of fat is not extracted; and, as a rough compensation for this, the reading of the top edge of the fat may be taken.

With the tubes in use in the Lister-Gerber methods the case is somewhat different. The extraction of fat is, it is believed, more nearly complete, and the necessity for any allowance is in consequence less. Thus the bottom surface may be taken, though some experienced observers allow for the small underestimate thereby caused by reading a point slightly above the lowest point of the curve. For these reasons, therefore, it is considered that for the Babcock test the upper edge should be read, while for Lister-Gerber tests the lowest point of the curve may safely be taken.

Some investigations have recently been carried out by the United States Department of Agriculture in connection with the above point, particularly as regards testing of cream. The system in vogue in some districts of America of paying for cream delivered at a central creamery on the basis of butter-fat, as ascertained by the Babcock method, renders the accurate manipulation of the test a matter of vital importance. Many of the creameries are stated to be gradually departing from the rules for operating this test, as experience seems to show that they obtain less butter from 100 lb. of butter-fat from cream

than they had previously obtained from the same measure under the whole milk system.

Emphasis is laid in the Report on the necessity for obtaining a sample of uniform composition, and also of weighing rather than measuring the sample used for the test bottle, but the most interesting feature of the work is an examination of the effect of the curved surface of the fat, or meniscus, as it is termed, in bottles of different diameters. A series of thirteen bottles were selected, ranging in diameter of neck from ·23 of an inch to nearly ·59 of an inch. The bottles were filled with water to some point in the lower part of the neck, and then 1 grain (representing 5·55 per cent.) of pure butter-fat was weighed into the neck. The bottles were whirled in a hand tester and read at 120 degrees F. Readings from the extreme top to the bottom of the fat column were carefully made, and the depth of meniscus measured. The result showed that the 10 per cent. milk bottles, having a diameter of neck of about a quarter of an inch, gave a reading of 5·70 and 5·80 respectively, while the 50 per cent. 6-in. cream bottles, having a diameter of over half an inch, gave a reading of from 7 to 7·40 per cent., the depth of the meniscus in the latter case being ten times as great as in the former. It will be seen that the 10 per cent. milk bottles read more than the true amount, whereas in general practice the reading of these bottles is supposed to indicate the amount exactly. In ordinary milk testing it is estimated that about two-tenths of 1 per cent. adheres to the inside of the bottle below the neck, and that the total length of the fat column will give a correct reading. In these experiments, however, the fat was weighed into the neck of the bottle, and was, therefore, known to be all in the neck, so that the effect of measuring the whole of the curved surface seems as apparent in the case of the 10 per cent. bottles as with the others. The excess over the true amount and the depth of the meniscus was found to increase regularly as the necks of the bottles increased in diameter, and it was evident that the true reading would fall somewhere between the reading of the top and the reading at the bottom of the curved surface of the fat. A careful inspection showed that if from the total length of the fat column there were deducted four-fifths of the depth

of the meniscus or curved surface, the result would be very near the true amount.

The question is also discussed whether it is necessary to allow in practice for the two-tenths of 1 per cent. of fat which is assumed to remain below the neck of the bottle. The tests which were made showed that the Babcock readings, less four-fifths of the depth of the meniscus, were generally very slightly lower than the figures ascertained by extraction; the addition of ·2 per cent. gave, however, a figure decidedly in excess of the true amount, and it is considered that as nearly every error in sampling and making tests tends towards a larger reading than the correct one, the addition might safely be omitted.

The use of narrow-necked bottles is recommended in order to get wide divisions of scale. For cream testing the 30 per cent. 9-in. bottles graduated to ·2 per cent. were found most accurate, the 50 per cent. 9-in. bottles graduated to ·5 per cent. were next in accuracy, but the 30 per cent., 40 per cent., and 50 per cent. 6-in. bottles, which are extensively used in creameries in the Western States of America, were found too inaccurate in their results for their use to be recommended.

Compensation for Injuries to Workmen in Agriculture.

The object of the Workmen's Compensation Act, 1900, is to extend to workmen in agriculture the benefits of the Workmen's Compensation Act, 1897. If any personal injury by accident arising out of, and in the course of, employmen in agriculture is caused to a workman, his employer is, subject to certain provisions, liable to pay him compensation. No employer is liable to pay compensation under the Act unless he habitually employs one or more workmen in agriculture; but if this condition is fulfilled, the employer is liable to pay compensation to all workmen employed by him in agriculture, whether such employment is continuous or casual.

The precise meaning of the word "habitually" in this Act

is not very clear, but the mere fact that the employment by any person of agricultural labour is not continuous throughout the year would not seem to exempt such person from liability under the Act, and it is therefore prudent for any person employing agricultural labour, whether casually or continuously, to ensure against liability in respect of injuries to all persons so employed by him.

An inquiry* into the law relating to compensation for injuries to workmen has recently been conducted by a Departmental Committee appointed by the Home Office, and with reference to the doubt which is felt as to the meaning of the word "habitually," they observe that there has as yet been no reported decision of the Court of Appeal on the subject. In one County Court case the question arose whether the widow of a workman who had been killed by falling off a load of hay was entitled to compensation from a small farmer occupying about 20 acres of grass land, and employing no labour except at hay-harvest, when he engaged three or four men for about three weeks. It was held by the County Court Judge that the farmer was exempted from liability. The indefiniteness and uncertainty attending the word "habitually" was pressed upon the Committee, and they think it would be very desirable to adopt some more exact definition if the test of the amount of labour employed is to be retained.

Evidence was also put before them as to the financial position of a small farmer, and the possible ruin that might be entailed upon him in the event of a serious accident happening to a labourer employed by him. The liabilities imposed by the Act, have, they point out, been explained in Leaflet 61 issued by this Department, but it is to be feared that they are imperfectly appreciated by large numbers of small employers, and that the precaution of insurance is much neglected. The Committee think, therefore, that it is desirable to find some means of excluding the small employer from the operation of the Act, and in recommending an amendment of the wording of the Act they suggest that the test should be whether the employer, in addition to the labour of himself

* [*Cd.* 2208. *Price* 2*s.* 2*d.*]

and the members of his family, employs throughout the year at least one workman in agriculture.

Closely connected with this question is that of the liability of the employer to the casual labourer in agriculture, and the Committee have come to the conclusion that the Act should not apply to casual labour. The difficulty, however, is to find a satisfactory definition of casual labour. If the workman is engaged by the week or any longer period, the labour, in the opinion of the Committee, is not casual. If he is engaged by the day or hour, or for a particular job, the labour should be considered to be casual, and the liability should not attach unless it is intended that the employment should be of permanent character.

Ordnance Survey Maps for Schools.

In the report on the progress of the Ordnance Survey for 1903-4 it is mentioned that a new departure was made in the past year which renders the Ordnance Survey maps more available for educational purposes. At the instance of the Geographical Association arrangements have been made, with the consent of the Treasury, for the issue to schools of a special edition of the maps, on the scale of six inches to a mile and smaller scales, at a very low price, with the view of promoting geographical education. These maps are issued in editions of not less than 200, on a written undertaking from the head-master, or other responsible representative of the school, that they will be used for educational purposes only in the school. Over 46,000 of these maps were supplied in 1903-4. It is hoped that the use of these maps will conduce to improve geographical education, while they help to make the Ordnance Survey maps better known. Forms of application and further particulars can be obtained from the Director General of the Ordnance Survey, Southampton.

[*Report on Ordnance Survey. Cd.* 2195. *Price* 3*s.* 11*d.*]

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of August, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 10	7 6	39 0	36 3
Herefords	8 0	7 5	—	—
Shorthorns	7 10	7 4	38 4	35 5
Devons	8 1	7 7	—	—
	per lb.* d.	per lb.* d.	per lb.* d.	per lb.* d.
Veal Calves	7½	6¾	8¼	7
Sheep :—				
Downs	8½	7¾	—	—
Longwools	8	7¼	8½	7
Cheviots	8¾	8	9	8
Blackfaced	8½	7½	8½	7¾
Cross-breds	8½	7¾	9	8¼
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	5 8	5 5	5 9	5 1
Porkers	6 2	5 11	6 3	5 5
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows —	£ s.	£ s.	£ s.	£ s.
In Milk	20 11	17 19	20 16	17 0
Calvers	20 14	17 4	20 8	16 10
Calves for Rearing	2 3	1 14	1 19	1 6
Store Cattle :—				
Shorthorns—Yearlings ...	9 1	7 15	9 16	7 17
,, Two-year-olds	12 18	11 4	14 17	12 0
,, Three-year-olds	15 12	14 11	16 13	15 6
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools—Hoggs, Hoggets, Tegs and Lambs	33 5	29 10	—	—
Scotch Half-breds ,, ...	—	—	29 5	25 8
Store Pigs :—				
Under 3 months	16 1	12 7	22 9	16 0
Over 3 months	30 10	24 2	26 8	22 4

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of August, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF:— English	1st	56 0	53 8	52 6	54 10	58 4*	58 4*
	2nd	53 8	47 10	47 10	46 8	52 6*	51 4*
Cow and Bull ...	1st	—	45 6	45 6	45 6	46 8	43 2
	2nd	—	39 8	42 0	39 8	42 0	38 6
U.S.A. and Canadian:— Birkenhead killed	1st	51 4	50 2	49 0	52 6	50 2	52 6
	2nd	49 0	43 2	46 8	46 8	47 10	—
Argentine Frozen Hind Quarters ...	1st	40 10	36 2	39 8	43 2	39 8	39 8
American Chilled Hind Quarters ...	1st	63 0	61 10	63 0	65 4	64 2	64 2
VEAL:— British	1st	67 8	61 10	59 6	64 2	—	60 8
	2nd	59 6	50 2	50 2	50 2	—	—
MUTTON:— Scotch	1st	74 8	—	70 0	72 4	78 2	71 2
	2nd	70 0	—	63 0	64 2	64 2	58 4
English	1st	68 10	70 0	70 0	70 0	—	—
	2nd	64 2	53 8	58 4	61 10	—	—
Argentine Frozen ...	1st	35 0	36 2	35 0	35 0	35 0	36 2
LAMB:— British	1st	75 10	70 0	70 0	74 8	78 2	73 6
	2nd	70 0	63 0	65 4	66 6	71 2	64 2
New Zealand ...	1st	56 0	58 4	56 0	57 2	58 4	—
	2nd	53 8	54 10	—	52 6	—	—
PORK:— British	1st	51 4	53 8	56 0	51 4	47 10	49 0
	2nd	44 4	42 0	51 4	44 4	46 8	42 0

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each of the under-mentioned Weeks in 1904, and in the corresponding Weeks in 1903 and 1902.

Weeks ended (*in* 1904).	Wheat.			Barley.			Oats.		
	1902.	1903.	1904.	1902.	1903.	1904.	1902.	1903.	1904.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 2 ...	27 7	25 0	26 3	26 7	23 11	22 1	19 10	16 10	15 5
„ 9 ...	27 8	24 11	26 6	26 7	24 1	22 6	20 0	17 0	15 7
„ 16 ...	27 8	24 11	26 11	26 11	24 1	22 3	20 0	16 10	15 9
„ 23 ...	27 7	25 0	27 3	26 7	24 1	22 4	20 3	16 11	15 11
„ 30 ...	27 4	25 4	26 11	26 7	24 3	22 3	20 2	17 0	15 8
Feb. 6 ...	27 2	25 6	26 9	26 9	23 9	22 4	20 3	16 11	15 11
„ 13 ...	26 11	25 6	26 8	27 5	23 7	22 2	20 3	17 1	15 9
„ 20 ...	27 1	25 4	26 11	26 11	23 4	22 7	20 4	17 1	16 0
„ 27 ...	27 1	25 3	27 10	26 8	23 2	22 4	20 5	17 1	16 3
Mar. 5 ...	27 0	25 3	28 8	26 8	23 1	22 6	20 5	17 1	16 5
„ 12 ...	27 1	25 1	29 1	26 6	22 10	22 5	20 6	17 0	16 8
„ 19 ...	27 1	25 1	28 6	26 4	22 9	22 9	20 6	16 10	16 7
„ 26 ...	27 2	25 2	28 2	27 2	22 4	22 8	20 7	17 0	16 7
Apl. 2 ...	27 3	25 3	27 11	26 5	22 6	22 10	20 6	17 0	16 6
„ 9 ...	27 5	25 4	27 10	26 7	21 10	22 5	21 0	17 2	16 5
„ 16 ...	27 7	25 6	27 9	27 1	21 6	22 6	21 1	17 3	16 4
„ 23 ...	28 9	26 1	27 9	26 5	21 9	22 0	21 6	17 9	16 4
„ 30 ...	29 9	26 10	27 8	27 5	22 1	21 1	21 10	18 0	16 3
May 7 ...	30 9	27 6	27 4	26 10	21 10	20 8	22 6	18 2	16 7
„ 14 ...	31 1	27 9	27 1	25 3	22 5	19 10	22 5	18 4	16 6
„ 21 ...	31 6	27 10	26 9	25 4	23 7	20 4	22 6	18 5	16 7
„ 28 ...	31 6	27 8	26 9	25 1	23 7	19 8	22 10	18 5	16 7
June 4 ...	31 3	27 6	26 10	24 3	23 10	18 8	22 11	18 4	16 8
„ 11 ...	30 11	27 8	26 6	23 8	21 5	18 5	22 8	18 7	16 10
„ 18 ...	30 6	27 6	26 5	23 5	20 7	18 2	23 0	18 3	16 8
„ 25 ...	30 5	27 6	26 5	24 3	22 0	19 2	22 9	18 6	16 10
July 2 ...	30 8	27 9	26 4	25 5	20 7	18 8	22 5	18 6	17 1
„ 9 ...	30 10	28 1	26 6	24 8	19 11	19 8	22 10	18 3	17 1
„ 16 ...	30 11	28 3	26 10	23 8	20 5	18 9	22 10	18 7	17 6
„ 23 ...	31 5	28 7	27 7	25 0	20 10	18 10	22 8	18 5	17 6
„ 30 ...	31 8	28 11	28 0	25 0	21 0	19 9	22 10	18 6	17 10
Aug. 6 ...	31 7	29 3	28 3	24 11	20 1	19 9	22 11	18 8	17 10
„ 13 ...	31 7	29 11	28 4	24 9	21 3	19 9	22 2	18 10	17 7
„ 20 ...	31 5	29 9	28 8	22 10	20 4	22 5	21 11	18 6	16 7
„ 27 ...	31 7	30 0	29 5	26 2	22 3	23 2	21 0	18 7	16 5
Sept. 3 ...	29 9	30 3	30 2	24 6	22 5	25 3	19 10	18 5	16 3
„ 10 ...	27 10	28 6	30 0	27 5	22 4	24 10	19 2	17 0	16 1
„ 17 ...	27 1	27 5		26 4	24 2		18 4	16 4	
„ 24 ...	26 6	27 0		26 4	24 0		18 0	16 2	
Oct. 1 ...	25 10	26 3		25 11	23 9		17 5	15 9	
„ 8 ...	25 5	25 10		26 2	23 8		17 2	15 6	
„ 15 ...	25 1	25 8		26 1	23 9		17 0	15 5	
„ 22 ...	24 11	25 10		26 4	23 7		17 0	15 8	
„ 29 ...	25 0	26 0		26 7	24 2		17 3	15 8	
Nov. 5 ...	25 1	26 4		26 3	24 3		17 2	15 9	
„ 12 ...	25 0	26 6		25 11	24 6		17 3	15 9	
„ 19 ...	24 11	26 9		25 6	24 3		17 2	15 10	
„ 26 ...	25 0	26 6		24 11	23 11		17 0	15 11	
Dec. 3 ...	25 1	26 8		24 4	23 9		17 0	15 9	
„ 10 ...	25 0	26 7		24 3	23 2		16 10	15 9	
„ 17 ...	24 10	26 9		24 2	23 0		16 10	15 7	
„ 24 ...	24 10	26 5		24 1	22 5		16 8	15 6	
„ 31 ...									

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1903.	1904.	1903.	1904.	1903.	1904.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	June ...	41 3	34 9	24 2	21 5	19 3	16 0
	July ...	40 11	34 7	24 1	21 1	18 10	15 11
Paris:	June ...	42 7	34 7	24 9	20 5	19 0	15 11
	July ...	42 9	35 2	24 5	20 4	18 11	16 8
Belgium:	April ...	27 10	30 0	22 7	21 7	17 3	15 3
	May ...	28 10	30 0	22 2	21 5	17 7	15 0
Berlin:	June ...	36 3	37 10	—	—	19 7	18 5
Breslau:	June ...	32 1	37 10	23 2	22 5	18 2	17 1

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets.*

AVERAGE PRICES of **British Wheat, Barley** and **Oats** at certain Markets during the Month of August, 1903 and 1904.

—	Wheat.		Barley.		Oats.	
	1903.	1904.	1903.	1904.	1903.	1904.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	29 6	28 0	21 4	20 3	19 0	17 8
Norwich	29 7	28 1	21 0	18 9	17 1	16 0
Peterborough ...	29 3	28 2	19 0	20 7	17 11	17 2
Lincoln	29 4	28 4	—	22 7	18 6	17 4
Doncaster	28 7	27 8	—	—	18 8	18 3
Salisbury	29 10	28 6	21 8	21 5	18 11	17 9

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels* computed from the Weekly Averages of Corn Returns from the Returning Markets of ENGLAND AND WALES, pursuant to the Corn Returns Act, 1882, together with the QUANTITIES returned as sold at such Markets, in the under-noted periods of the Years 1904, 1903, and 1902.

Quarter Ended	Prices. 1904.	Prices. 1903.	Prices. 1902.	Quantities. 1904.	Quantities. 1903.	Quantities. 1902.
Wheat.						
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters.*
Lady Day ...	27 5	25 2	27 3	614,479	694,912	826,066
Midsummer ...	27 1	26 11	29 10	547,623	639,441	444,639
Michaelmas ...	—	28 8	30 2	—	307,834	222,495
Christmas ...	—	26 3	25 0	—	654,536	754,737
Barley.						
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters.*
Lady Day ...	22 4	23 5	26 8	895,030	975,720	669,251
Midsummer ...	20 5	22 2	25 6	79,211	98,961	40,875
Michaelmas ...	—	21 6	25 1	—	28,938	32,318
Christmas ...	—	23 8	25 5	—	1,772,130	2,040,980
Oats.						
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters.*
Lady Day ...	16 0	16 11	20 3	420,597	372,119	239,048
Midsummer ...	16 6	18 0	22 1	185,660	188,528	88,274
Michaelmas ...	—	18 0	21 3	—	120,931	101,130
Christmas ...	—	15 8	17 0	—	368,417	402,833

* Section 8 of the Corn Returns Act, 1882, provides that where returns of purchases of British Corn are made to the local inspector of Corn Returns in any other measure than the imperial bushel or by weight or by a weighed measure, that officer shall convert such returns into the imperial bushel, and in the case of weight or weighed measure the conversion is to be made at the rate of 60 imperial pounds for every bushel of wheat, 50 imperial pounds for every bushel of barley, and 39 imperial pounds for every bushel of oats.

CORN PRICES :—HARVEST YEAR.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels computed from the Weekly Averages of Corn Returns, together with the QUANTITIES returned as sold at the Returning Markets during each of the Harvest Years ending 31st August, 1890 to 1904.

Harvest Years.	Prices. Wheat.	Prices. Barley.	Prices. Oats.	Quantities. Wheat.	Quantities. Barley.	Quantities. Oats.
	s. d.	*s. d.*	*s. d.*	*Quarters.*	*Quarters.*	*Quarters.*
1889–90 ...	31 2	28 10	18 6	3,289,806	3,281,141	558,053
1890–91 ...	35 5	28 0	19 1	3,496,788	3,659,382	602,887
1891–92 ...	33 4	27 2	20 8	3,267,038	3,260,327	488,830
1892–93 ...	26 8	24 10	18 9	2,676,227	3,383,094	547,412
1893–94 ...	25 5	26 5	18 4	2,087,062	2,876,977	542,425
1894–95 ...	21 5	21 5	14 8	2,180,959	3,136,415	693,121
1895–96 ...	24 10	22 4	14 1	1,640,943	3,366,364	672,547
1896–97 ...	28 8	23 2	16 9	2,597,268	3,200,612	551,912
1897–98 ...	36 2	26 11	18 3	2,534,224	3,339,842	599,666
1898–99 ...	26 0	26 1	17 3	3,498,515	3,629,760	777,676
1899–00 ...	26 4	25 2	17 4	3,255,654	3,355,241	722,859
1900–01 ...	27 1	25 0	18 1	2,463,341	3,109,149	684,956
1901–02 ...	28 4	25 11	20 4	2,451,275	3,176,599	698,840
1902–03 ...	26 5	23 4	17 8	2,386,017	3,151,337	1,104,660
1903–04 ...	27 2	21 10	16 4	2,129,448	2,780,473	1,132,086

ERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of August, 1904.

Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
TTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British	12 9	11 0	—	—	—	—	12 3	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	103 0	100 6	102 0	98 6	101 9	97 9	104 4	—
Danish ...	113 0	111 9	113 6	110 0	112 0	108 8	110 1	—
Russian ...	91 6	87 0	—	—	89 0	83 0	88 6	83 6
Australian ...	95 6	89 0	—	—	—	—	—	—
New Zealand...	100 0	98 0	—	—	—	—	—	—
IEESE :—								
British Cheddar	58 0	54 0	—	—	68 6	63 6	52 6	48 3
			120 lb.	120 lb.	120 lb.	120 lb.		
,, Cheshire	—	—	51 9	43 6	51 6	44 0	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	42 6	41 6	41 6	38 9	41 3	39 3	43 0	40 3
CON :—								
Irish	64 6	58 6	61 0	57 3	62 0	58 3	65 3	61 9
Canadian ...	56 0	49 0	52 3	49 6	50 0	48 0	48 9	47 9
AMS :—								
Cumberland ...	96 0	89 0	—	—	—	—	—	—
Irish	100 0	87 0	—	—	—	—	102 0	92 0
American ...	54 0	49 3	57 0	53 6	54 9	49 6	56 6	53 6
GS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	10 6	8 1	—	—	—	—	—	—
Irish	8 1	6 10	8 11	7 6	8 1	7 4	8 4	7 6
Danish ...	8 3	7 1	9 4	7 9	9 4	8 7	9 0	7 4
	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
TATOES :—	89 6	79 6	68 0	54 0	79 6	71 6	63 6	—
Y :—								
Clover... ...	84 6	73 6	82 6	61 6	80 0	75 0	56 0	51 0
Meadow ...	80 0	71 0	66 6	43 6	57 6	45 0	—	—

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	August.		8 Months Ended August.	
	1904.	1903.	1904.	1903.
Swine-Fever :—				
Outbreaks	81	130	996	1,109
Swine Slaughtered as diseased or exposed to infection ...	238	829	4,576	5,688
Anthrax :—				
Outbreaks	56	70	668	545
Animals attacked	124	100	1,056	832
Glanders (including Farcy) :—				
Outbreaks	149	196	1,068	1,026
Animals attacked	230	318	1,879	1,683
Sheep-Scab :—				
Outbreaks	9	17	940	1,092

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	August.		8 Months Ended August.	
	1904.	1903.	1904.	1903.
Swine-Fever :—				
Outbreaks	34	33	151	129
Swine Slaughtered as diseased or exposed to infection ...	632	934	3,094	2,877
Anthrax :—				
Outbreaks	—	—	2	2
Animals attacked	—	—	2	3
Glanders (including Farcy) :—				
Outbreaks	—	1	8	2
Animals attacked	5	1	29	3
Rabies (number of cases) :—				
Dogs	—	—	—	2
Sheep-Scab :—				
Outbreaks	*1	*3	*366	*395

* These figures refer to July, and to the periods ending July, respectively.

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THE JOURNAL
OF THE
BOARD OF AGRICULTURE.

Vol. XI. No. 7.

OCTOBER, 1904. [NEW SERIES.]

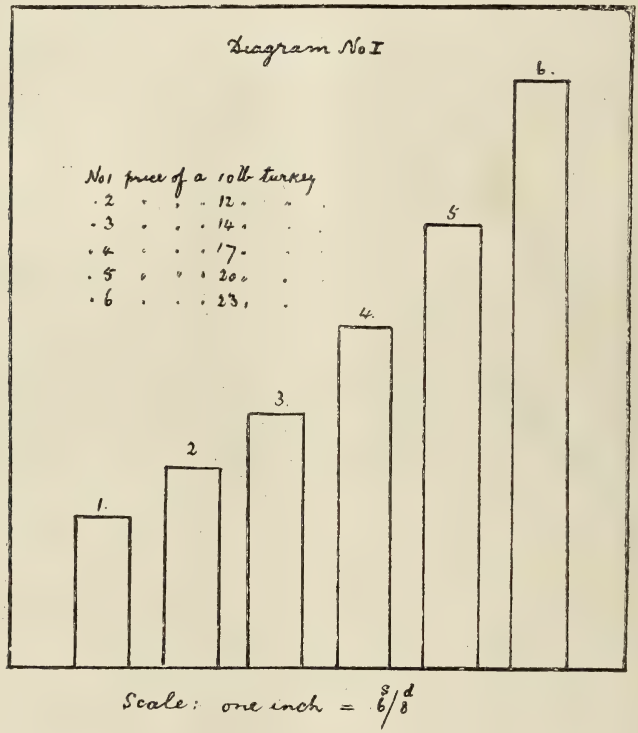
EXPERIMENTS IN FATTENING TURKEYS.

To increase the weight of a well-bred turkey cockerel by 4 lb. and upwards is not only possible, but even easy if the bird is put under a special course of fattening for about three weeks preparatory to killing. In this article I shall endeavour to show how this can be done in the best and most economical way. The value of the turkey per lb. is, it must be remembered, considerably enhanced by special fattening. From my close connection with the turkey trade conducted by the Irish Co-operative Societies during the Christmas season of 1903, and in previous years, and from reliable information obtained from private firms, I am convinced that it scarcely pays to raise and market small, lean turkeys, whereas the profits on well-fattened birds of good weight should be very considerable. This may be shown in a measure by the following table, setting forth the average net prices obtained by co-operative poultry societies and by private shippers for well-handled turkeys, plucked after the London, Glasgow, Devonshire, or any other style as required :—

Turkeys	weighing	under 10 lb. ...	... 8d. per lb.
,,	,,	10 lb. to 12 lb. ...	... 9d. ,,
,,	,,	12 ,, 14 ...	... 10d. ,,
,,	,,	14 ,, 17 ...	... 11d. ,,
,,	,,	17 ,, 20 ...	... 1s. ,,
,,	,,	over 20 lb. ...	... 1s. 1d. to 1s. 2d. per lb.

These were net prices obtained for good, fat turkeys, plucked and dressed as required by the buyer, but not drawn. Expenses such as freights, hire of hampers, &c., were paid by the purchasers. There was no commission, market tax, or any other allowance

deducted from the prices quoted. From these particulars it may be seen that whilst the price of a young fat turkey cockerel weighing 21 lb. figured out at 22s. 9d. to 24s. 6d., the small birds, which weighed only 10 lb., were sold at 6s. 8d. apiece. Moreover, the demand for heavy turkeys was very keen, and London and other merchants readily made contracts at net fixed prices for as many birds weighing 17 lb. and upwards as any firm or society would undertake to supply, whereas the



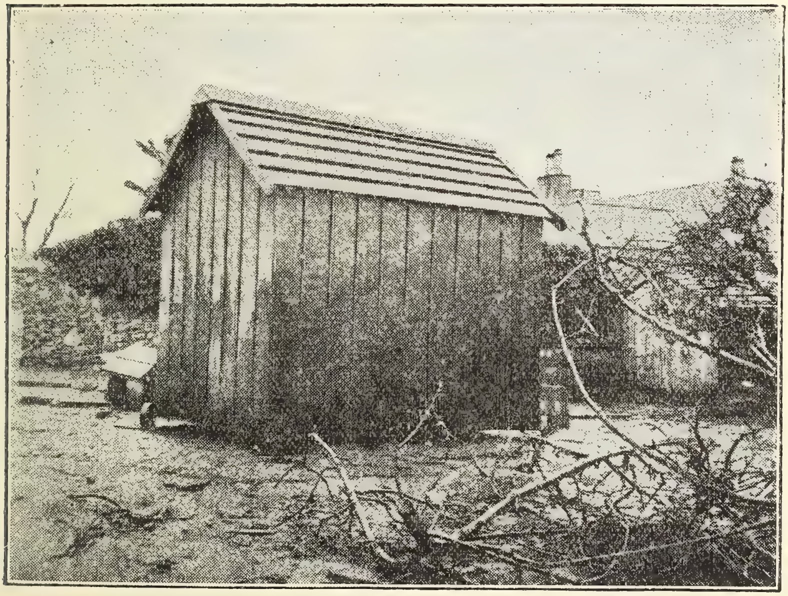
smaller turkeys were sold in many instances with the greatest difficulty, and sometimes it was found necessary to consign them for sale "on commission."

All this goes to show that the farmer's best chance of making turkey-raising a profitable industry is to raise the largest birds possible, and to increase their weight by fattening to the last ounce which the frames can support. Very much depends upon the breeding, for it is impossible to raise a mongrel bird of poor quality and small size to a fair weight by any system of

feeding or fattening, but, given a fine breed of turkeys, such as the American Bronze, the Cambridge, or the Black Norfolk, the farmer has it in his own hands to raise worthless, under-sized birds, or, on the contrary, to raise a flock of twenty-pounders.

I have prepared the diagram given on the preceding page with the object of illustrating the difference in price between turkeys of various weights:—

I may point out that Column No. 5 represents the price of a 20-lb. turkey, which is three times the amount which one can



PORTABLE HOUSE FOR TURKEYS ON STUBBLES.

obtain for a 10-lb. turkey, as represented by Column No. 1; and again it is shown that one 23-lb. turkey, as represented by Column No. 6, is of the same value on the market as four 10-lb. turkeys, or, in other words, one would have to raise 40 lb. of turkey flesh in four small lots of 10 lb. apiece to make as much money as would be received for 23 lb. in one lot.

In November, 1903, having found myself in possession of a very fine flock of pure-bred American Bronze turkeys, I decided to make some experiments in fattening, in order to ascertain which of the three systems generally recommended would give

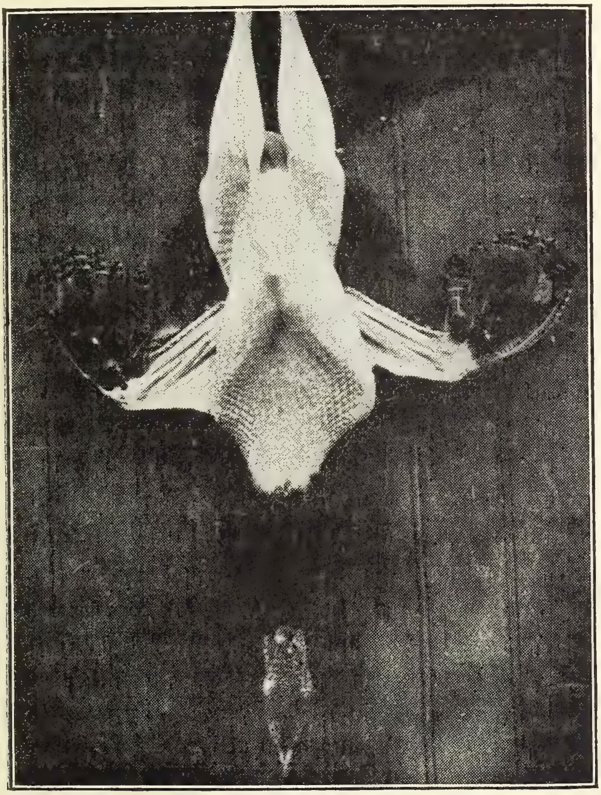
the best results. These birds were all of the same strain and breed, having been bred from a 38-lb. cock and 21-lb. hens, and being in very fine condition after the stubble feeding, they were excellent subjects for experimental purposes. I had put them on the stubbles of two fifteen-acre fields of barley and oats when these crops had been gathered in about the middle of September, and they were housed in portable wooden buildings in the fields. For several weeks they found all the food which was necessary for them, in the loose corn combined with the grasses, weeds, seeds, and similar foods which they would naturally pick up from ground which had recently grown a crop of corn, and had not been used by animals or poultry for a considerable time.

When the supply of scattered grain began to diminish and the turkeys were hard set to find as great a quantity as they required, they were fed by hand once a day. This feeding commenced about the middle of October, when the birds had been supporting themselves on the stubbles at little or no cost for nearly a month, and had improved so much in strength, size, and health that one would not know them for the same birds which had been turned from the farmyard to the stubbles only four weeks before. This feed was given in the evening, which is the best time to feed young turkeys at range in stubbles when one meal per day only is required. It consisted of a mash made of three parts boiled potatoes, one part middlings, one part bran, and one part maize meal, wet with skim milk. The use of one part barley-meal and one part ground oats in the mash would have been preferable, but the grinding season for these corns had not opened, and there was none in stock from the previous year.

The birds improved rapidly under this treatment, which was continued until they had consumed almost all the scattered grain, and the occasional kernels which they could still discover were found only by diligent searching, and were of little value in sustaining them. In the first week of November it became necessary to feed them three meals per day. Although there was little or no feeding now in the stubbles, they were allowed to remain there for the sake of the run, so that they might grow as large in frame as possible. The three meals which were fed, consisted of mash as before, with barley-meal and ground oats

added, twice a day, and whole barley or oats for the last meal before roosting time.

On the 24th of November all the turkeys were brought into the yards for fattening, and thirty large, healthy cockerels of uniform size and weight were selected for the purpose of the experiment. These were divided into three lots, each containing ten birds, and were housed in an airy shed, thirty feet long by



TURKEY PREPARED FOR THE LONDON MARKET.
(BREAST VIEW).

fifteen feet wide. This shed was divided into three compartments by means of closely-boarded partitions, and thus each flock of ten turkeys had to itself a room ten feet by fifteen. Attached to each compartment there was also a small yard in which the birds were fed and given exercise daily. Three different methods of fattening were carried out from the 24th of November until the 15th of December. The following table

shows how the birds progressed under the different treatments and the final results represented by increase in weights :—

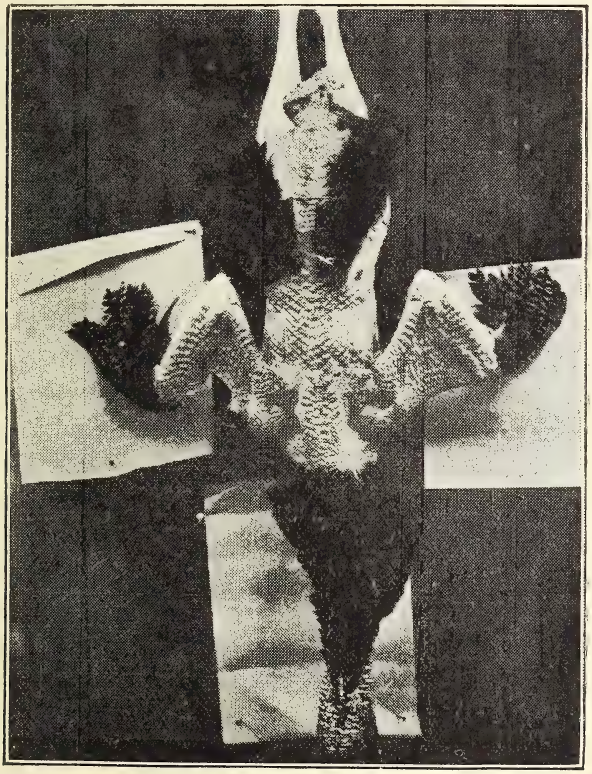
Lot No.	Number of turkey cockerels.	Weight on Nov. 24th.	Weight on Dec. 5th.	Weight on Dec. 15th.	Total increase in 21 days.	Average increase in 21 days.
		lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.
1.	10	170 0	189 8	198 0	28 0	2 12
2.	10	171 0	191 0	205 0	34 0	3 6
3.	10	170 0	190 0	212 8	42 8	4 4

As may be observed by an examination of the above table, there is a very great variation between the results of the different methods of feeding adopted and tried in Lots 1, 2 and 3, and I now proceed to give a detailed description of the foods used and the methods of feeding practised throughout the trials.

During the first half of the fattening period, or, to be more accurate, during the first ten days, the three lots of turkeys were fed alike and in the following manner :—A mash consisting of the following food-stuffs was made up at night and allowed to stand over for use on the following morning : Two parts boiled potatoes, two parts boiled turnips, two parts barley-meal, two parts maize-meal, two parts ground oats, and one part linseed meal containing 12 per cent. of oil. Having been thoroughly mixed and mashed, these constituents were wetted with as much skim milk as would make the whole into a rather stiff mash. In the morning at eight o'clock the mash was placed in V-shaped troughs in the small yards attached to the house, and the turkeys were allowed out in the yard for an hour to eat it. At the same time they were provided with both milk and water in separate vessels and with grit and charcoal mixed together and piled in a dry corner of the yard. Within the hour they had ample time to eat their morning meal, to partake of grit, charcoal, water or milk, and to take as much exercise as they required at this stage of their career.

They were then turned into the houses, which are situated in a quiet place unfrequented by other poultry, and which were kept semi-dark while occupied by the turkeys. In these stalls they quietly passed the day until evening came, when they were ready for their second and last meal of the day, for during the

period of fattening it is not advisable to feed turkeys or fowls oftener than twice a day. This last meal consisted of Indian corn, oats and barley, all crushed and mixed together, and this compound was fed from troughs in the yards, in the same manner as the morning mash was fed. The turkeys returned to the houses and spent the night there, not roosting but resting on the ground, which was well littered with straw.



TURKEY PREPARED FOR THE LONDON MARKET. (BACK VIEW).

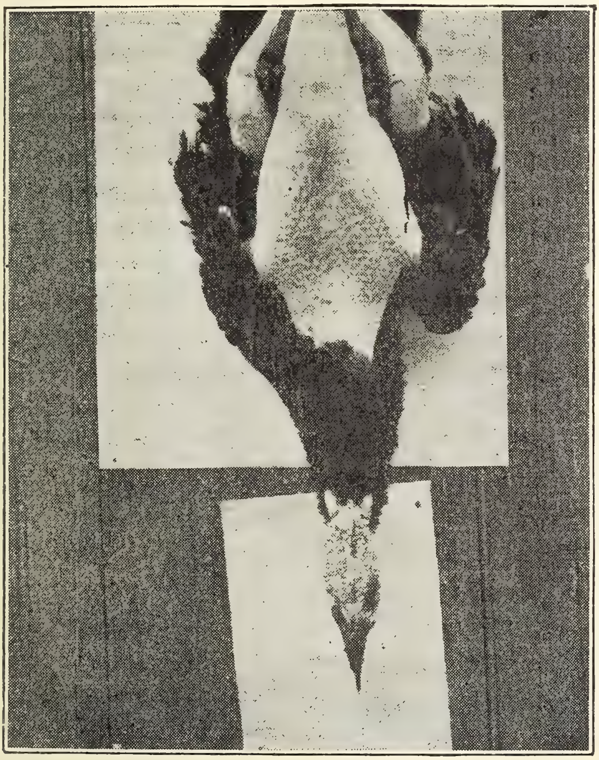
The above was the treatment which was accorded to all the turkeys for the first ten days, and Lot No. 1 was treated exactly as described throughout the whole period of twenty-one days, except that an allowance of two ounces of melted fat for each turkey was added to the mash every day during the latter half of the fattening period.

Lot No. 2 was put under a system of cramming, which has very often been recommended in poultry newspapers, and which

is, in some parts of these islands, practised to a great extent by farmers and turkey fatteners. The system may be described in these words :—A stiff mash is made of equal parts barley-meal, maize-meal, and ground oats, with a small proportion of melted fat and linseed meal and some skim milk, and this is placed in a large pail or other vessel by the side of a woman (or sometimes a boy or man), who sits on a low stool. Close at hand she has also a large bowl of skim milk, and, taking the mash, she works it into pellets, about two inches long and three-quarters of an inch in diameter. She makes a pile of these sufficient to feed one turkey, and the bird to be crammed is then handed over to her by an attendant. She takes it between her knees, opens the beak, holding the head well up, and the neck stretched to its full length, and dipping the pellets one at a time in the milk, she passes them down the bird's gullet into the crop. A large cock turkey will take from a pound to a pound and a half of mash when crammed in this manner, but as the birds are docile, and can swallow the food rapidly, it does not take as long a time to cram a flock as one would suppose, without having seen the operation performed by a skilful hand. The birds are crammed in this way twice a day, but though the method gives fairly good results it cannot be said to equal the method adopted with Lot No. 3, which has now to be described.

The turkeys in Lot No. 3 were fed during the latter half of the fattening period in a manner somewhat similar to that practised by the poultry-raisers of Kent, Sussex, and Surrey, who are so eminently successful in producing the high-class and far-famed "Surrey fowls." The turkeys were not, however, confined in coops, as fowls would be, but were allowed to remain in the section of the house already described. The house was well littered with straw, and the birds were confined there and not permitted to take any exercise in the yard. A cramming machine was used to administer the food, which was given in a semi-liquid form twice daily, and this machine was wheeled into the house when the times for feeding came round. At first there was some difficulty about cramming these large cock turkeys, because, on account of their size and strength, they could not conveniently be taken under the arm in the

usual manner of cramming fowls ; but this slight difficulty was overcome by placing the birds, one at a time, on a low stand, which raised them sufficiently off the ground to bring the head on a level with the nozzle of the cramming machine, and in such a position that the feed could be given quite conveniently. After a day or two the turkeys grew accustomed to this manner of feeding, and when meal times came they showed



TURKEY PLUCKED AND TIED IN THE DEVONSHIRE STYLE

much eagerness to mount the stand and receive their share of food.

The foods used were the same as those fed to Lot No. 2, but they were mixed and made up in a different way. Equal parts of barley-meal, maize-meal, and finely-ground oats were taken and mixed thoroughly. Then some pure linseed meal containing 12 per cent. of oil was added—only 2 oz. to each bird per day, *i.e.*, 1 oz. per meal. The whole was mixed with

skim milk until it was as thin as thick cream, and to this an allowance of melted fat, equal to 1 oz. per meal for each turkey, was added. This thin mash or slop formed in this manner was allowed to stand for twelve hours before being used, and it was then poured into the reservoir of the machine,

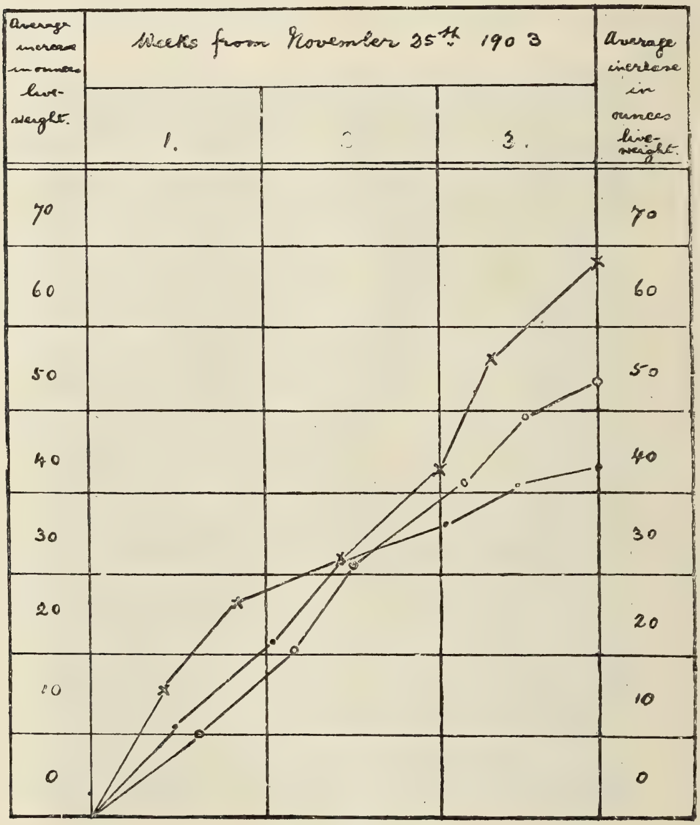


Diagram II.

and pumped through the india-rubber nozzle into the crops of the birds in the way already described. This treatment was continued up to the time of killing, namely, the 15th of December, and the results were quite satisfactory, as shown in the table of figures set forth above.

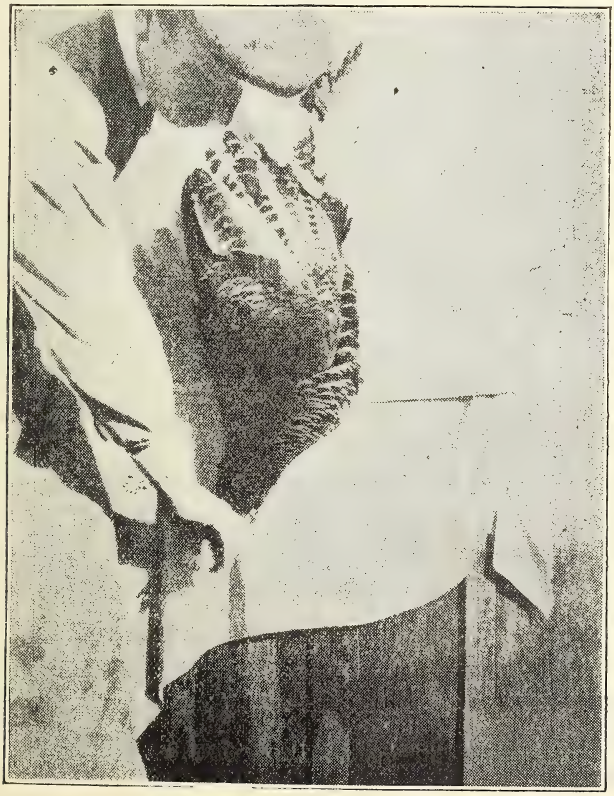
A clear idea of the results arrived at by the three systems of fattening turkeys may be obtained from Diagram No. 2, on each method is shown as follows :

Lot No. 1 : . —— . —— .
Lot No. 2 : o —— o —— o
Lot No. 3 : × —— × —— ×

A comparison of the table of figures given on p. 390 with the Diagram will enable the results from the three systems of fattening described to be easily understood.

Killing and Plucking.

As supplementing the various methods of fattening turkeys above described, a few notes on the subject of killing and



METHOD OF KILLING TURKEY BY DISLOCATION OF THE NECK.

plucking the birds may be of service. There is little use in producing turkeys, or indeed any kind of poultry of fine quality, unless they are handled and dressed so that they may attract the attention and please the eye of the prospective purchaser.

The method of killing and dressing must depend entirely upon the customs of the market to which the birds are to be sent, and it will be necessary for the prospective seller to ask for special instructions from the dealer or other purchaser to whom he is selling his birds.

The two chief methods of killing turkeys are by "dislocation of the neck," and by "bleeding." When killing by the first of these methods, the operator takes the turkey by the thighs and the tops of the wings in the left hand, and taking the head in the right hand, he draws it steadily until dislocation takes place. The skin remains unbroken and no blood escapes, but all there is in the body drains into the neck and remains there. If the turkey is large and strong, it is necessary to hang it up by the legs in order that the operator may fully exert his strength in killing it. When the turkey is to be bled, it is also strung up by the legs with its head hanging downwards. The operator then gives it a sharp blow with a short stick on the back of the head, and when he has stunned it by this means he inserts a sharp knife through the roof of the mouth, piercing the brain. He also severs the large arteries of the throat by a circular motion of the knife, and the bird rapidly bleeds to death. These two methods of killing are shown in the accompanying illustrations.

Turkeys for the markets require to be plucked, but not drawn or trussed. One of the neatest methods of plucking is known as the "Devonshire" style, and consists in stripping the feathers clean off the breast and thighs, but leaving the neck, back, and wings covered, and then tying down the legs with strong cord in such a manner as to show up the plumpness of the breast prominently. For other markets, again, the turkeys must be clean plucked all over, excepting the first joint of the wings and the neck, which are left in their feathers. Another method which is much favoured is to leave a bunch of feathers on either hip about 3 in. from the tail, and also on the tops of the wings and the neck, and to clean pluck the remainder of the body. Turkeys prepared according to any one of these styles may not be acceptable in the market to which they are sent, and for this reason it is advisable that those who intend to kill turkeys for market should receive

explicit directions from the merchant who has agreed to buy them.

In conclusion, I may say that the turkey industry is a very profitable one, but there is still considerable room for

METHOD OF KILLING TURKEY BY PIERCING THE BRAIN.

improvement in our methods of breeding, raising, fattening and marketing turkeys, and if these received all the attention they deserve, there is no doubt that the value of the turkey industry would be appreciably increased.

H. DE COURCY.

STORING TURNIPS.

The main reason for storing turnips is to protect them against damage by frost, though protection against ground game, rooks and wood pigeons, which may be very hard on roots exposed during winter, is also an important object in some districts. Not only should a good system of storage secure these ends, but it should also protect the roots against decaying and becoming too dry.

The more important methods of preserving turnips over winter are as follows:—

1. In large heaps, whose length and breadth will depend on the quantity of roots to be stored, but whose depth should not exceed $3\frac{1}{2}$ ft. The sides are covered by some 12 in. of straw, overlaid by 4 in. of soil on the sides exposed to the prevailing winds, though 3 in. of soil will suffice on the other sides. The top of the heap is covered by 6 in. of straw kept in position by poles, branches, &c. Old straw ropes removed from stacks that have been thatched may be usefully thrown over the straw. Soil should not be spread on the top of the heap, as it gets washed through amongst the roots and dirties them.

2. In oblong heaps, like large potato pits or clamps. The base should have a breadth of 7 ft., and on this the roots are piled, gradually contracting to the top like the roof of a house. The whole is afterwards covered by some 12 in. of straw, overlaid by 4 in. of soil on the side exposed to the prevailing wind. On the sheltered side the covering of soil should not exceed 2 in. in depth. Many farmers do not place a complete covering of soil on the sheltered side, but only a spadeful of soil on every square foot. The ridge of the heap is, in any case, left clear of soil, so that free ventilation is secured. This style of heap requires more covering in proportion to its contents than the last, but under no system of storing are the roots better preserved.

3. In small heaps, equally distributed over the field where the roots were grown. Each heap usually contains about 30 cwt., but in some districts, heaps containing only about half-a-ton of roots are formed, in which case, if the crop is a good one, no

carting is necessary, the roots being simply thrown together by hand. The size of the heaps should be regulated by the size of the flock consuming them, the object being to provide a day's supplies in each heap. Thus, with a flock of 200 sheep getting 20 lb. per head per day, about 35 cwt. would be daily required, and this would approximately represent the contents of each heap. The troughs would be moved each morning to a fresh heap, and thus the field would be evenly manured. Should the turnips in these heaps be required within a few weeks of storing, they are usually only covered by the tops, kept in position by a few spadefuls of soil, but for longer storage a covering of straw and soil is necessary. Turnips seldom go wrong in such heaps, which have the additional advantage of being quickly formed. They are specially useful for roots that are intended for consumption by sheep in spring on the land where the crop was grown.

4. Laying two rows in one, and ploughing in, is an excellent method of storing roots on light dry land. Under this system the roots are not only well protected, but they are also placed under conditions that admit of their growing considerably if the winter is mild. The method of procedure is as follows:—The row is divided into four equal lengths, and a worker is assigned to each. An ordinary single mould-board plough opens a deep furrow close to the first row, throwing the soil outwards. The first worker then proceeds to lay the roots (with tops and tails attached) of the two adjoining rows into the furrow, and the plough on returning throws the earth back on the roots, leaving only the tops of the leaves exposed. Other two rows are then similarly dealt with, and so the work proceeds across the field. In spring, when required, the roots are lifted by ploughing up, dry weather being selected for the operation.

5. If labour is scarce or work is pressing, considerable protection may be given to growing roots by merely running the double mould-board ridging plough between the rows. In this way the roots, if not very large, are fairly covered, though not so thoroughly as under the previous method.

6. "Planting," as it is called, is practised locally in the North of England, and is regarded as the best way of preserving turnips for the use of lambing ewes. The turnips grow con-

siderably when stored in this way, and in spring possess a well-developed top, which is considered excellent for the production of milk. A dry well-sheltered stubble field, or a grass field that it is intended to break up in spring, is selected, and in October or early in November the roots are carted to it and placed in a single layer in their natural position, without topping or tailing. No protection is given, except along the sides, against which a furrow is laid. The only drawback to the system is that it entails the use of a large area of ground.

7. A favourite system on the Borders, where turnips are wanted for ewes in spring, is to cart the roots, with tops and tails attached, to a grass or stubble field, on which they are laid what may be called "cart-thick," that is to say, about 2 ft deep. By means of a strong rake or muck-hawk the roots are levelled out, care being taken to get the tops of the uppermost roots on to the surface. A furrow run round the clamp is sufficient protection. Roots stored in this way are found to be specially juicy and fresh in spring, and this system of storage has the additional advantage of being rapid and economical.

The following points should be generally observed in storing turnips :—

A dry open situation should be selected on which to place the heaps. Although proximity to a wood or hedge may secure shelter from cold wind, roots often keep much worse under such circumstances than in an open exposed place.

The roots should be dry and clean when carted. If topped and tailed, the operation should be conducted so as to injure the bulb as little as possible.

The turnips should be well matured before storing. This is indicated by the lower leaves being yellow.

It is a good plan, weather permitting, to leave the roots lying in the field, after topping and tailing, for three or four days before carting. This hardens the skin, and brings them into better condition for storing.

Unless frost threatens, soil should not be put on the heaps for at least a week after the roots are carted. This permits of the circulation of air and escape of moisture.

A word of warning must be uttered as to the danger of

spreading finger-and-toe by means of stored turnips. Roots with any suspicion of the taint of this disease should not be consumed on tillage land, but should be carted on to permanent pasture. Further information on this subject is contained in Leaflet 77.

AGRICULTURAL IMPORTS OF CEREAL YEAR.

A comparison of the imports during the period known as the cereal year (1st September to 31st August) has a special significance only in the case of the grain crops which are brought in to supplement the British harvest, but it may be convenient to show, as in the table on the next page, the receipts of other agricultural products during the same period.

The steady growth in the purchases of wheat from abroad has now been a marked characteristic of our Trade Returns for some years, and the past season saw another material advance on the quantities previously imported; the total amounted to 93,102,000 cwt. as compared with 85,123,000 cwt. in 1902–3, and 74,703,000 cwt. in 1901–2, so that in the course of two years there has been a growth of some 18½ million cwt. The countries contributing to the supply vary in importance according to their harvest conditions, but up to the past season the United States had for many years occupied the premier position as a wheat grower for the British markets. In 1903–4, however, the receipts from this American source fell to 12,897,000 cwt. compared with 32,035,000 cwt. in 1902–3, and 41,584,000 cwt. in 1901–2, and represented only 14 per cent. of the total supply, as against 56 per cent. in 1901–2, and an even larger proportion in some earlier years. The figures for the past three seasons have been as follows:—

—	In Thousands of Cwt.		
	1903–4.	1902–3.	1901–2.
India	23,144	11,908	7,428
Russia	19,331	13,721	3,061
Argentina	17,490	11,856	4,973
United States	12,897	32,035	41,584
Canada	8,355	11,471	8,302

The receipts of wheat-flour, on the other hand, do not exhibit much change, the total quantity during the past three years having been about 19,100,000 cwt. Taking the wheat grain and flour together and expressing the flour in its approximate weight as grain, the imports in 1903-4 represent 27,927,000 qrs. (of 480 lb.) of wheat. The estimated quantity of this grain obtained in the United Kingdom from the harvest of 1903 was 6,100,000 qrs., so that the foreign grain represented no less than 82 per cent. of the gross supply available for all purposes in these islands.

The figures for the principal cereals in each of the past ten harvest years are given below:—

Year.	In Millions of Cwt.				
	Wheat.	Wheat-flour.	Barley.	Oats.	Maize.
1903–1904	93·1	19·1	31·9	15·2	47·6
1902–1903	85·1	19·2	25·7	16·6	41·6
1901–1902	74·7	19·1	23·1	16·7	47·2
1900–1901	71·2	23·3	18·7	22·1	55·8
1899–1900	65·0	21·6	15·2	19·8	57·7
1898–1899	67·0	22·9	22·9	14·9	57·5
1897–1898	66·4	20·0	20·3	15·4	55·6
1896–1897	65·0	20·0	21·7	18·4	59·7
1895–1896	68·8	19·9	22·0	15·1	44·5
1894–1895	80·6	18·7	25·2	15·7	27·7

In the case of barley, as with wheat, the imports, it will be seen, reached a very high figure, being more than double the quantity received in 1899-1900. Russia, Roumania, Turkey, and the United States were the principal exporters, the receipts from Russia amounting to 13,204,000 cwt. The imports of oats were rather less than they have been for some years past, and this is the only important grain that has shown but little tendency to expansion. Maize, though received in rather larger quantities than in 1902–3, shows a figure lower than in any of the five years from 1896-97 to 1900-1. The principal source of supply was Argentina, from which country 24,283,000 cwt. were received. In the previous year the United States took the first place with 16,309,000 cwt., and in 1901–2 Roumania headed the list with 20,035,000 cwt.

Turning to the remaining items in the general table, the

imports of fresh beef, both dead and on the hoof, were rather larger than in the preceding year. In the case of mutton, although there was some increase in the receipts of live sheep, fresh mutton declined from 3,865,000 cwt. to 3,589,000 cwt.

Articles.		1st Sept., 1903, to 31st Aug., 1904.		1st Sept., 1902, to 31st Aug., 1903.	
		Quantities.	Values.	Quantities.	Values.
			£		£
Horses	No.	20,512	489,801	28,473	656,140
Cattle	,,	547,626	9,668,301	486,497	8,744,514
Sheep and Lambs	,,	369,313	572,017	319,430	497,012
Bacon	cwt.	5,374,627	12,963,926	5,000,911	13,589,018
Hams	,,	1,223,796	3,145,896	1,203,825	3,323,425
Beef:					
Salted	,,	150,211	192,510	167,440	261,057
Fresh	,,	4,220,269	8,089,391	3,854,438	8,024,445
Mutton, fresh ...	,,	3,589,095	6,996,404	3,864,600	7,608,167
Pork:					
Salted (not Hams)	,,	243,320	299,974	217,236	306,400
Fresh	,,	660,940	1,461,176	652,152	1,448,450
Meat unenumerated:					
Salted or fresh	,,	637,750	1,175,193	669,527	1,213,853
Preserved otherwise than by salting ...	,,	849,819	2,633,342	746,259	2,350,306
Rabbits	,,	418,954	672,412	487,343	759,663
Corn:					
Wheat	,,	93,102,100	31,914,863	85,122,801	28,633,796
Wheat Meal and Flour ...	,,	19,141,758	9,289,275	19,179,674	8,866,287
Barley	,,	31,859,530	8,437,468	25,697,400	7,180,942
Oats	,,	15,188,900	3,953,695	16,578,022	4,486,192
Maize	,,	47,637,340	11,282,702	41,587,582	10,862,647
Butter	,,	4,360,784	21,642,360	3,942,571	20,291,166
Margarine ...	,,	915,488	2,387,240	896,838	2,365,002
Cheese	,,	2,585,882	6,267,049	2,552,497	6,691,346
Milk, condensed	,,	897,357	1,627,036	923,329	1,772,051
,, and cream, fresh and preserved	,,	—	—	—	—
Eggs ...	gt. hundreds	19,926,229	6,676,226	19,546,242	6,470,581
Fruit:					
Apples	cwt.	4,913,028	3,014,418	3,560,561	2,288,389
Pears	,,	451,398	485,068	442,718	425,908
Hops	,,	159,671	741,966	182,841	847,201
Onions ...	bushels	8,644,669	1,040,807	8,437,814	1,003,795
Potatoes	cwt.	13,482,112	3,107,041	6,124,753	2,028,364
Tomatoes ...	,,	1,129,314	1,014,171	1,026,306	902,766
Tallow and Stearine	,,	1,744,664	2,276,843	1,319,494	1,939,314
Wool	lb.	543,718,866	19,399,844	607,032,103	20,658,398
Hides, wet and dry	cwt.	774,874	2,040,392	830,404	2,228,896
Lard	,,	6,743,676	3,210,417	1,660,565	4,080,355
Poultry and Game		—	1,835,929	—	1,151,972
Vegetables (unenumerated) ...		—	455,478	—	391,047

The imports of bacon, which are derived mainly from Denmark (1,634,000 cwt.), United States (2,851,000 cwt.), and

Canada (795,000 cwt.), amounted to 5,375,000 cwt. The consignments from the latter country showed proportionately a considerable rise from 533,000 cwt. in 1902-3 to 795,000 cwt. in 1903-4.

Another farm product for which we are largely dependent on foreign countries is butter. The supply of this commodity has increased in the past five years from 3,402,000 cwt. in 1899-1900 to 4,361,000 cwt. in 1903-4, and towards this total Denmark contributes about one-fourth. Of the other Continental countries Russia, France, Holland, and Sweden were important sources of supply, while Colonial butter from New Zealand, Australia, and Canada amounted in the aggregate to 946,000 cwt., or 22 per cent. of the total in 1903-4.

Not much variation is noticeable in the imports of cheese, while those of eggs showed a comparatively small growth in the year.

Owing to the diseased condition of much of the 1903 crop of British potatoes the imports of this tuber were very large, chiefly from Germany, France, and the Channel Islands.

RENTING OF FARM LAND BY POULTRY-KEEPERS.

On every side there is abundant evidence that the keeping of poultry as a part of the farm stock has increased enormously of late years, not merely among the small farmers, who are able to give that personal attention without which poultry-keeping can never be successful, but also among occupiers of larger areas of land, both in arable and pasture districts. An estimate has been made that the value of eggs and poultry produced in Britain has increased during the last fifteen years by no less than £2,000,000 sterling; that is, the advance during 1903 as compared with fifteen years previously is in value £2,000,000. Whether such a computation is correct or not—and there are those who claim that it is under rather than overstated—it cannot be doubted that the supply of poultry produce is

much greater than ever before, as will be recognized by all who observe the agricultural conditions of the country. But we are far from having reached the limit of possibilities of development in this industry. Without making any estimate of the number of fowls of all grades now kept in Great Britain, it may safely be said that it would be practicable to multiply the number threefold without displacing any existing stock or crop. This is a most important consideration, for where such an addition can be made the increase is really an added crop, and offers a greater margin of profit than if, in order to provide room for the poultry, some other branch had to be abandoned. The direct financial return obtained by sale of produce is not the only source of revenue to be considered, the manurial value is also important. At a moderate estimate it is calculated that twenty-four hens under ordinary farm conditions will yield in twelve months a ton in weight of manure, which, in a moist state, has been valued by a high authority at £2 per ton—equal to 1s. 8d. per hen per annum. To secure this amount, it is essential that the manure shall be well distributed over the land. The plan of portable houses, described in the April number of this *Journal*, has been found most conducive to this end.

One of the great difficulties which farmers have to meet at the present time is the lack of skilful, trustworthy, intelligent labourers. This is noticeable in every department of farm work, even in such as have been regarded for generations as the regular operations of agriculture, and it is even more noticeable in the later developments of farming. Farmers have long been prone to regard poultry as unworthy of their attention, and their helpers have not been trained in the management of poultry. It is scarcely to be wondered at, therefore, that, on the principle of "like master like man," labourers are wanting in the knowledge of poultry-keeping necessary to enable them to undertake the care and oversight of fowls upon a large scale. So long as only a few birds were kept around the homestead to supply the household needs or to provide the good wife with pin-money, the question was not at all serious; but with an extension of operations there must be either increased personal attention or delegation of the

work to others. In the case of smaller farmers, who are accustomed either to perform all the work themselves or have the labour directly under control, the difficulty is not present to the same extent, and it is in this section of the farming community that the greatest increase in poultry-keeping has taken place. It may be noted that in the districts where small farms are most largely found the number of poultry bred and kept is greater than elsewhere, both in this country and on the Continent of Europe. Doubtless, in process of time, when a new generation has sprung up and the changes now apparent have taken effect, we shall find that the knowledge of this branch of live stock will be equal to that relating to cattle, sheep, and pigs ; and, perhaps, in days to come, a poultryman may be as necessary on a farm as a herdsman or a shepherd is now.

It is generally admitted to be one of the serious factors of our modern life that so large a percentage of the population of the country is concentrated in the great centres of population. On all sides we hear of enquiries made by those who have lived part or all of their lives in the cities and towns for houses with sufficient land upon which, by one or other form of what is called *petite culture*, they can earn a simple but sufficient living. The demand for such places is rapidly increasing, and their scarcity is beginning to be apparent. Suitable holdings, ranging from two to twenty acres, are taken up almost as soon as they are available, and the demand is likely to be greater in the future, especially if those living in rural districts meet it by providing holdings of suitable area, particularly in places where the land is good enough for the purpose.

The main difficulty is that the greater part of the land is already occupied. One method of meeting the demand for land without interfering with those who are already in occupation, more especially in respect to poultry-keeping, is being adopted to an increasing extent in various parts of the North of England, in the neighbourhood of the manufacturing villages of Lancashire and Yorkshire. There seems, however, no reason why the system should not be extended to all parts of the country. Even in the purely agricultural counties its adoption would add both to the incomes of farmers, and to the fertility of their land, would

increase the food production of the country, and would afford opportunity for a considerable expansion in rural enterprise. The system about to be described is no mere theory, but a practical fact, and one that has been proved over a series of years and in many places, with manifest benefit to farmers and poultry-keepers alike.

For the adoption of this system of poultry-keeping it is necessary to find, first, farmers whose land is suitable and who are willing to allow access to their fields, to someone not employed by them, with permission to place thereon poultry-houses and their inmates ; and, second, the present or would-be poultry-keepers who are ready to pay for the privilege of placing out their fowls in this way and are sufficiently responsible to be trusted for the fulfilment of their obligations. Of the second class there is no lack, but of the first the number is much smaller, for many farmers have either failed to see the advantages they would obtain or have a rooted objection to seeing other than their own men treading the land. Instances are known, however, of farmers who have found that the improvement of their land has been so great that had they paid a trifle for the birds to run over their land instead of being paid, they would have been justified in the expenditure. With wider experience of the system its extension may be anticipated, but where farmers themselves intend to take up poultry-keeping on a fairly large scale they are less likely to agree to others occupying their land, unless they have a much greater acreage than they can hope to stock.

In the districts where the system here referred to has found acceptance the land is chiefly pasture, used for the feeding of horses or of milk cows, and the poultry-keepers are usually operatives, without land of their own, or with only a small plot. It is finding acceptance, however, among poultry-breeders who have a few acres of land, but who desire to extend their operations. Such extension becomes possible where they are able to make arrangements with farmers for their birds to run over fields either all the year or for fixed periods. On pasture land and in orchards there need be no limitation of time ; where meadows are cropped for hay the fowls need only be removed ten weeks before cutting. But in corn- or root-growing areas it may be

difficult to obtain permission until harvest is over, though experience has shown that the time can be greatly extended without any harm resulting. Farmers, however, can hardly be expected to take the risk, if risk there be, with stock not their own, whatever they may do when the fowls are owned by them.

The terms commonly arranged between farmer and poultry-keeper are that the latter shall pay a rent for the privilege accorded him, varying in accordance with the local conditions. As much as 10s. per acre per annum has been known to be paid, but that was by a breeder of high-class stock. A more general rate is 2s. per acre, or 10s. per house per annum, the latter not to contain more than twenty-five fowls. In either case the number of birds per acre should be strictly restricted. On permanent pasture, where other stock are kept, the number should not exceed four or five per acre; but on meadows cut for hay or arable land ten to fifteen fowls per acre can be kept quite safely. The more kept, within reasonable limits, the better for the farmer, as he is securing a greater amount of manure. The arrangement made provides that the houses shall be moved about in accordance with the instructions of the farmer, and in order to prevent injury to the herbage the removal should be twice or three times per week. Hence the use of small portable houses is essential. If permanent houses were placed on the fields the grass therein and immediately around would be useless or killed, and there would not be that wide distribution of manure which yields the best results. On the other hand, the poultry-keeper must have access to the fields for the purposes of his work. He gains not merely by extension of his operations, but by the fact that the more widely his fowls are distributed the healthier they will be and the less they will cost to feed, as they obtain a great amount of natural food, more especially where the land is fresh and kept in good heart. Should the farmer who has entered into such an arrangement have arable land available, it would be mutually advantageous if the houses are placed thereon when ploughing is taking place, for the birds would clean the land, and by their activity improve its condition, whilst the poultry-keeper would find his fowls cost him a much less sum for food than when they are kept upon pasture land. It is thought that a trial of the system which has succeeded so well in the North

of England would prove equally beneficial in the corn counties where larger farms prevail.

Assuming that this dual system of poultry-keeping, as it may be termed, is satisfactory to the farmer, and yields him good returns, it is certain that it is likely to be satisfactory to the poultry-breeder, who has the advantage of a large area of land without the responsibility of cultivating it, and at a small rent. Some of those who are taking up aviculture have had no practical experience in the cultivation or cropping of land, and for a time at least are unlikely to be able to turn it to the best account or to obtain therefrom the largest returns, as it is important to remember that unless the manure given to the soil is utilised it becomes a danger as well as a loss. With a comparatively small acreage, chiefly used for keeping the breeding stock and for chickens during their earliest stages of growth, operations under the system described above can be conducted upon a more extensive scale, especially where the laying hens and older chicks can be scattered about in the way described. The care of the fields will be no part of the poultry-keeper's work, nor will rent bulk largely in his balance sheets, and he can more fully devote himself to the industry, with a greater amount of success. He will not meet with the temptation, which has led to the failure of so many, to overstock his own land, as it is to his interest and profit to utilise to the fullest extent the land thus placed at his disposal.

E. BROWN.

Potato Weighing at Railway Stations.

The attention of the Board of Agriculture and Fisheries has recently been drawn by one of their agricultural correspondents to the manner in which the weight of consignments of potatoes for conveyance by rail is determined at certain stations in Perthshire, and in this connection enquiry has been made as to the practice obtaining in some of the chief potato-growing districts.

The methods followed in the districts in which enquiries were made have been found to vary considerably.

In East Lothian potatoes are weighed on the land and placed in 8-stone bags for conveyance to the station, where they are emptied into trucks and consigned in bulk. The railway company usually accept the consignor's declaration as to weight, but occasionally submit it to a rough test.

In Ayrshire, where early varieties are largely grown, potatoes are usually consigned in barrels estimated to hold $1\frac{1}{2}$ cwt., and to this weight the railway company add $\frac{1}{4}$ cwt. for barrel and cover. There is no weighing either on the land or at the station. Sometimes, however, potatoes are consigned in bulk, when they are either emptied from the barrels into trucks or carted in bulk. Potatoes carted in bulk are passed over the weighbridge at the station.

In Lincolnshire it is the custom to weigh the potatoes on the land and place them in 8-stone bags, in which they are either consigned or taken to the station and emptied into trucks and consigned in bulk. There is no strict adherence to any rule as to weighing at the stations. At some the officials weigh all consignments, at others either the declared weight of the consignor is accepted or the weight of the consignment is computed from the weight of one bag, while at certain stations all three practices obtain.

At certain stations in Perthshire and Forfarshire potatoes delivered in bulk are weighed by the officials and an allowance made for the quantity of adhering soil, the amount of the allowance depending upon the discretion of the official. Carriage is charged upon the reduced weight, which is entered upon a slip accompanying the consignment, together with a notice to the effect that the weight is not guaranteed. An objection alleged against this system is that the buyers insist upon accepting the reduced weight as the actual weight of the consignment, although the reduced weight is frequently less than the actual weight; and, as in many instances the consignor has no knowledge either of the gross weight or of the allowance made, the concession made by the railway company to the farmer may in some cases have operated to his disadvantage.

It has been suggested that if the company concerned would slightly alter the form of the slip so that it should show the gross weight of the consignment and the exact amount of the

allowance made for adhering soil the information would be of use to many farmers in the district referred to.

Potatoes in Germany.

Potatoes form a crop of considerable importance in Germany, as in addition to their employment for human food, they are used for stock-feeding and for the manufacture of alcohol and starch.* The area devoted to their cultivation in Germany is about 8 million acres, and the production (excluding diseased tubers) on the average of the five years 1899–1903 is officially estimated at 40,202,000 tons, the yield obtained being approximately 5¼ tons per acre. The whole of the produce may be regarded as consumed in the country, the imports and exports over a series of years practically balancing one another. The imports come chiefly from the adjoining countries of Belgium, Holland, Austria-Hungary, and Russia, and have averaged about 160,000 tons annually in 1901–3. The exports in the same period have been rather greater, amounting to about 230,000 tons per annum. In 1903 the United Kingdom was Germany's largest customer, while Belgium, Holland, Sweden, and Switzerland also drew small supplies from this source.

The official statement as to the condition of the German crops, which was issued on September 26th last by the German Imperial Statistical Bureau, gives an unfavourable view of the position of the potato harvest, and it is not improbable, therefore, that during the ensuing season Germany may become a more decidedly importing country than is the case in normal years. The condition of the crop for the whole Empire is numerically indicated in the Report by the figure 3·4, a position nearly midway between a medium and a small crop. (The condition of the crops is shown by figures, thus 1 = very good, 2 = good, 3 = medium, 4 = small, and 5 = very small.) In consequence of the drought which has prevailed throughout the summer, the

* An account of the employment of potatoes for alcohol was given in this *Journal*, April, 1904, Vol. XI., No. 1.

late potatoes in many districts, notably in East Prussia, are very backward, and need a long, warm autumn, with favourable showers, to ripen the tubers. No such low figure has been recorded in September during the past eleven years, the nearest approach being in 1896, when 3·1 was given, and in that year the final yield only averaged $4\frac{1}{5}$ tons per acre, compared with a ten year average of about $5\frac{1}{4}$ tons.

A New Tuber in France.

A species of tuber of the potato family, not previously cultivated in Europe, has recently been introduced into France, where its experimental cultivation appears to have been attended with considerable success. The tuber in question, known as *Solanum Commersonii*, was obtained from Uruguay by M. Heckel, Director of the Colonial Institute at Marseilles, and specimens were distributed by him to various cultivators, one of whom, M. Labergerie, has communicated to the Société Nationale d'Agriculture de France an interesting account of the experiments carried out by him since 1901.

The specimens received by M. Labergerie included two distinct types of *Solanum Commersonii*, differing from one another in a marked degree. One of these, which may be taken to be the original type, produced suckers, and the tubers were deeply buried and distributed in all directions. The second, a violet-skinned variety, produced tubers clustered round the foot of the mother plant, and partly above ground. The tubers, moreover, of the first were found to possess a bitter flavour, while the second had, on the contrary, a sweet taste. The origin of this variety is unknown, but it was suggested to the Society by M. Schribaux that it was not merely a spontaneous variation, but the result of a natural cross between the *Solanum Commersonii* and the *Solanum Tuberosum*, or ordinary potato. The correctness of this suggestion cannot be confirmed, as it has not been found possible to produce such a cross artificially.

With regard to the original type, it is stated that when once established in the soil the plant perpetuates itself by its under-

ground roots, and subsequent planting is unnecessary. Its flowers, which are very abundant and of a pale violet colour with a shade of yellow, emit an odour similar to jasmine. The tubers are white with a yellowish skin, and have at first a markedly bitter flavour, but they were found to improve with cultivation, and in two years the proportion of good and eatable tubers increased by 10 to 20 per cent. So far, however, as these experiments have gone they have, in the majority of cases, been found too bitter for human consumption, but their improvement, it is said, promised to be very rapid. They are willingly consumed by animals, especially when cooked, and on the wet and marshy soils, which appear well adapted for their cultivation they might form a valuable food for stock. A yield of about $6\frac{1}{2}$ tons per acre was obtained in 1902, and about $4\frac{1}{2}$ tons in 1903, on a fertile soil, but without any manuring or cultivation beyond a single hoeing when the shoots first appeared. The subsequent very abundant growth was sufficient to choke all weeds.

The tubers are rich in starch, and may prove valuable as an industrial plant. A successful attempt was made experimentally to employ the flowers for the production of perfume, and it was also found that the fruit, though not abundant, contained the perfume in a more concentrated form.

Besides the above original type, three variations have been observed, one of which promises to be of importance. Among the plants distributed in the first instance it was noticed that one was characterised by stronger stalks, and at the foot of the stalk two tubers of a blackish violet colour formed, which were very dissimilar to the tubers described above. These were found to be very sweet and fine flavoured, with a hardly perceptible bitterness. The tubers produced by this plant were carefully preserved and planted separately. In this variety the plant forms a central stem, with numerous branches and exuberant vegetation. Flowers were not abundant, and on some plants they were entirely wanting; they had no odour, and seemed to be sterile. The tubers form round the central stem. They vary in colour: when young they are white, gradually becoming rose-coloured, and finally violet. The flesh is usually white or yellow; the flavour is said to be perfect, in their young state they are sweeter than the best potatoes with a slightly aromatic

flavour ; when fully grown they preserve their sweetness with a tinge of bitterness, but the aromatic taste is more pronounced.

The soil apparently most suited to the cultivation of this variety is damp or even wet, the cultivation being similar to that of the ordinary potato, except that in order to avoid drying the soil ridging is not desirable. Harvesting is easy owing to the position of the tubers, and owing to the abundance of the foliage a single hoeing is sufficient. The yield obtained is apparently very large, being equivalent on the small area planted to about 40 tons per acre. The tubers are much appreciated by stock.

Basic Slag for Poor Pastures.

Although the efficacy of basic slag as a remedy for poor or deteriorated pasture may be regarded as a generally recognised fact, enquiries are frequently made by farmers respecting the soils to which this manure is specially applicable, the time at which it should be applied, and the quantity necessary to produce the desired effect. The following account of the results obtained from a series of experiments with basic slag which have been carried on during the past nine years by the Bath and West of England Society in the counties of Somerset, Devon, Dorset, and Sussex, has been furnished to the Board by Mr. F. J. Rowbotham, Botanical Visitor to the Bath and West of England Society. The sites for these experiments, it should be mentioned, were selected with a view both to their absolute need of improvement and their fitness as representative types of large and important areas, whilst the soils embraced such varieties as come within the category of ordinary soils of pasture land.

The evidence derived from these experiments points conclusively to the fact that the renovating capabilities of basic slag are most strikingly manifested in the case of those stiff, retentive clays which, from their coldness and their liability to become water-logged during the winter and to parch in the summer, are frequently the despair of the farmer. At the same time, excellent results have been obtained from *medium* land, consisting

of a fairly even mixture of clay and sand, and it is only when dealing with soils of essentially *light* character, *i.e.*, containing far more sand than clay, that the use of basic slag alone has failed to produce the desired effect. In the case of such soils it has been found advisable to employ potash, in the form of kainit, in conjunction with the basic slag.

Notwithstanding the fact that the effects of basic slag are dependent in a measure upon differences in the soil—even where, as in the case of the clays, the soils belong to the same class—the one broad fact elicited by its use is that it tends to encourage whatever leguminous herbage may be normally present in the pasture. The significance of this statement, however, can only be fully appreciated when the normal herbage of one of these poor pastures is compared with that of the plot subjected to the influence of basic slag. The marked stimulation of the clovers must, and in fact does, imply the displacement to a very great extent of the noxious, or at best useless, weeds which, as a general rule, occupy such land; hence it will be seen that the entire herbage undergoes a transformation, and, acre for acre, yields sevenfold the quantity of nutriment. And it should be noted that this beneficial result has accrued in numerous instances where the normal proportion of clovers was so small as to be scarcely appreciable.

It has likewise been demonstrated, as a result of these experiments, that the improvement effected by the basic slag has extended to the whole of the herbage—the evidence as to this being derived from the fact that stock will graze to an even extent the entire herbage of a pasture thus treated, instead of confining their attention to the clovers. This power of rendering the collective growth of a pasture more palatable to stock must therefore be reckoned as a further point in favour of the use of basic slag in those cases where, from poverty of soil conditions or any other cause, the herbage in its normal state is commonly rejected.

The tests to which basic slag has been subjected in the course of these experiments have been as thorough and conclusive as it was possible to make them. Typical pastures have been selected in some of the poorest districts situated respectively on the Weald clay of Sussex, the heavy, cold clays of West Dorset,

the loams and moorland clays of North Devon, and the poor loams and peaty soils of East Somerset, where the soil for the most part is held by coarse rank weeds, and in every instance the results of a single application of basic slag in the early spring, at the rate of six to eight hundredweights per acre, have been strikingly manifested during the first season following the application. In more than one case of a field overrun by carnation-grass, rush, and bents, with moss filling every interspace, and entire patches of herbage consisting exclusively of yellow-rattle, hardheads, or other coarse-growing weeds, it has been observed in the course of a few months after the application of basic slag that a complete transformation has been effected in the character of the herbage—the weeds have gone under, and the clovers have been stimulated to such an extent as to convert the pasture into a perfect clover-ley.

If it be objected that basic slag alone appears to exercise little effect upon the grasses, as compared with the clovers of the pasture, it may be well to bear in mind that the growth of the grasses has in no instance been found to be prejudiced by the encouragement of the clovers, whilst in some cases the basic slag has undoubtedly stimulated certain species of grass. On the other hand, the experiments have demonstrated that the application of a nitrogenous manure, following upon the basic slag, has a powerfully stimulating effect on every species of grass normally present in the pasture.

The Heating or Fermentation of Hay.*

It is well known that when hay which is not quite dry is placed in a shed or stack, spontaneous generation of heat takes place. It has generally been held that this action is entirely due to the work and activity of bacteria, but recent investigations by Boekhout and Vries at the Agricultural Experiment Station of Hoorn, in Holland, appear to prove that the fermentation of hay is a purely chemical

* From *Centralblatt für Bakteriologie, Parasitenkunde u. Infektionskrankheiten.* September, 1904.

process, and is quite independent of the work of living organisms. They ascertained the temperature of haystacks in which heating was manifestly taking place, and found that it might considerably exceed 200 degrees F. As compared with ordinary hay which had not undergone much fermentation, heated hay was found to contain a larger percentage of albumenoids, woody fibre, and fat, but a smaller quantity of sugar and starch. Furthermore, the heated hay was markedly sour, owing to the presence of considerable quantities of formic acid.

The investigators then proceeded to construct an apparatus which enabled them, through the agency of steam and air, to reproduce very closely in the laboratory the changes that take place in the haystack. The hay was kept under treatment for twenty days, at the end of which time the material smelt exactly like hay that had fermented in a stack, and when subjected to chemical analyses it showed precisely the same changes as were found to have taken place in hay which had heated naturally. The temperature of the receptacle in which the artificially heated hay was kept was never less than 203 degrees F., so that the conditions were such as to preclude the activity of living organisms. In order, however, to verify the result, hay was sterilised at a temperature of 248 degrees F., and this material also, when put through laboratory treatment, attained the same condition and composition as heated hay from a stack.

The investigators are therefore perfectly confident that they have proved satisfactorily that the fermentation of a hay stack is in no way associated with the activity of living organisms, though they do not yet feel justified in attempting to offer an explanation of the causes that induce the high temperatures which are met with in the interior of a mass of fermenting hay. As they consider that they have shown that this form of so-called fermentation is purely chemical, they are disposed to cast doubts on the necessity of any bacterial action in the case of many other similar processes, as, for example, in the maturing or fermentation of tobacco.

Perennial and Italian Rye Grass.*

Perennial Rye Grass has been cultivated in England for more than two hundred years. In grows nearly everywhere and on all classes of soil. Though at times much depreciated and at other times over estimated, it is, nevertheless, one of the most valuable of grasses, both for permanent pasture and for rotation cropping. It is specially valuable as a bottom grass on soils of a somewhat heavy nature, where it lasts for many years, but its duration as a perennial plant is largely dependent upon the character of the soil and of the climate. As it tillers freely, it forms a more or less complete bottom sward. Depasturing should commence comparatively early, as the seed culms become hard and dry, and are not relished or readily eaten by stock.

Italian Rye Grass may be grown successfully on a wide range of soils, but gives the heaviest return upon those that are stiff and rich. It is a larger and more robust plant than Perennial Rye grass, and affords an earlier bite or cutting in the spring; it is also superior in nutritive value. It should be used exclusively as a rotation crop, for which purpose, when grown on rich, moist soils and irrigated with liquid manure, it is not surpassed in quantity or quality by any other forage crop.

The impurities found in seeds of both these varieties of Rye Grass are Yorkshire Fog, Soft Brome Grass, Rye-seeded Brome, Upright Crowfoot, Sheep Sorrel, Forget-me-not, Ox-eye Daisy, Rib Grass, and Hair Grass. The average purity of the samples of Italian Rye Grass tested at Aynsome last season was 93·4, and of Perennial Rye Grass 96·5 per cent.; but the purity of good commercial seed should be, it is stated, at least 96 or 98 per cent. The imported seed of Italian Rye Grass is, as a rule, very impure, but the standard indicated can be maintained by careful cleaning. The seeds of Perennial Rye Grass are largely, if not entirely, grown in the South of Scotland and the North of Ireland, and before cleaning usually contain an undesirable amount of various weed seeds.

The average germination of the samples of Italian Rye Grass tested at the station was 88·5, but in samples of the highest

* Bulletin of the Aynsome Seed-Testing Laboratory.

quality the vitality ought to reach 90 to 95 per cent. In the case of Perennial Rye Grass the germination tests gave the high average of 98 per cent.

Importation of Breeding Stock into United States.

The United States Treasury Department have recently issued revised Regulations for the importation of breeding animals. The Act* of March, 1903, under which these Regulations are made, provides that any animal imported by a citizen of the United States specially for breeding purposes shall be admitted free if it is pure bred of a recognised breed and duly registered in the books of record established for that breed. It requires that a certificate of such record and of the pedigree of such animal shall be produced and submitted to the Customs officer, duly authenticated by the proper custodian of such book of record, together with the affidavit of the owner, agent, or importer that such animal is the identical animal described in said certificate of record and pedigree.

The Regulations, dated August 17th, 1904 (Circular No. 82), which have been made in pursuance of these provisions, are as follows:—

No animal imported for breeding purposes shall be admitted free of duty unless the importer furnishes a certificate of the record and pedigree in the form hereafter given in the appended list of registers, showing that the animal is pure bred, and has been admitted to full registry in a book of record established for that breed, and that its sire and dam and grandsires and granddams were all recorded in a book of record established for the same breed. An affidavit by the owner, agent, or importer that such animal is the identical animal described in said certificate of record and pedigree must be presented.

In the case of sheep, females are frequently recorded by flocks, and not individually; therefore, whenever the names of individual ancestors cannot be given in the pedigree, the certificate should be filled out in such manner as to show the volume and page of the Flock-Book in which the ancestors for two generations are recorded.

Unless the certificate of record and pedigree herein provided for is produced, the animal shall be considered dutiable as not being pure bred of a recognised breed, and duly registered in the book of record established for that breed, and under no circumstances will officers of the Customs accept certificates of record issued from books other than those mentioned in the accompanying list.†

In case such certificate is not at hand at the time of the arrival of the animals, a

* *Journal*, June, 1903, Vol. X., p. 108.

† The list of Herd-Books &c. other than those kept in the U.S.A. includes most of those dealing with British breeds.

voluntary bond may be given by the importer, in double the amount of the estimated duties, conditioned for the production of the requisite certificate within six months, subject to extension for a like period on application to the Secretary of the Treasury, and such bond shall be cancelled only upon the production of a pedigree certificate conforming substantially to Paragraph 10 of these Regulations, or payment of full liquidated duties. Should the importer elect, estimated duties may be paid and a written stipulation filed with the collector within ten days thereafter to produce the requisite certificate within six months from date of entry, whereupon final liquidation will be suspended until the production of the certificate or the expiration of the six months; and upon production of the requisite certificate in due form within six months from entry, the amount deposited shall be refunded as an excess of deposit.

Proof of the importation of animals for sale *for breeding purposes* must be produced, and the affidavit of the importer, first, that he is a citizen of the United States, and second, that the animals are to be sold by him for breeding may be accepted as *primâ facie* evidence of those facts. The fact that the animals are of superior breed and accompanied by proper pedigree certificates, establishes their status as breeding animals; and the use of such animals incidentally for driving or working would be no violation of the affidavit of the purchaser. In all cases the special purpose of breeding by the purchaser in the United States must be satisfactorily shown. Treasury decision 24,356 of April 13th, 1903, is modified accordingly.

The form of certificate of record and pedigree to be used for imported animals is given below. In filling up this form the registry number of each recorded animal, or in case there is no number the volume and page of register where the animal is recorded, is to be given. In the case of sheep registered by flocks the volume and page of the Flock-Book in which the flock is registered must be given.

		Sire........................
Pedigree of...............	Sire..........................	No..........................
....	No..........................	Dam ....
		No..........................
No.		Sire ....
	Dam	No..........................
	No..........................	Dam ....
		No..........................

I hereby certify that the above is a correct pedigree of ...., No. ....; that this animal is pure bred and has been duly registered in the ...., which is the book of record controlled by this Association for the .... breed of ....

(Signed) ....

Secretary of the ....

Dated at ....

.... 19

The following Treasury decisions which have been arrived at dealing with certain special points are also quoted in the Regulations:—

Animals registered in proper books of record within six months subsequent to importation are entitled to free entry.

Pedigree certificates may be returned to importers and copies retained on files of the Custom-House.

Animals otherwise entitled to free entry are not excluded because too young to be physically qualified for breeding when imported.

At least two generations of ancestors must appear in certificates of pedigree accompanying sheep imported for breeding purposes.

Wild animals and reptiles are not entitled to free entry when imported for breeding purposes.

Trotting Registers are not accepted as evidence of pure breed of horses.

Acceptance may be allowed of pedigree certificates of animals stating volume, and failing to give number of page, but otherwise correct, upon a sworn statement on the certificate of pedigree that the book in which the animal is recorded has not been, but is to be, printed.

Transportation under the Immediate-Transportation Act of Animals Imported for Breeding Purposes allowed only when caged, crated, or boxed.

The word "animal," as used in Paragraph 473, Tariff Act of 1897, is restricted in its application to quadrupeds—such as horses, cattle, sheep, swine, cats, dogs, &c.—and would not include fowls.

Improvement of Stock in Sweden.

In connection with the description given in this *Journal* (September, 1904, p. 356) of the steps taken by the Northumberland Agricultural Society to encourage the breeding of stock in that county, the following account of a system adopted in Sweden for the improvement of the quality of cattle owned by small farmers may be of interest.

The Skaraborg system, as it is called, was first tried in 1882 by the Agricultural Society of that district, and since that time it has been adopted by all the agricultural societies of Sweden. The plan is to hold annual local shows, at which prizes of varying amounts are awarded for cows and heifers belonging to farmers not holding more than 123 acres of land, and in addition the prize animals, and also apparently animals which are "approved," receive a ticket entitling them to the free service of a prize bull. The tickets are to be handed to the owner of the bull, from whom they are redeemed by the prize jury at sums varying with the quality of the bull. An animal which has once taken a money prize cannot receive another in the same class, but it can be exhibited at each competition in order to receive a fresh covering ticket.

Medals are awarded for bulls, the exhibition of which is unrestricted, and it is one of the objects of the system to

induce large farmers to procure good bulls, *i.e.*, bulls likely to win a prize for which the free tickets could be used, whilst at the same time it places at the disposal of the smaller men the services of a good bull free of cost.

A number of agricultural societies have also tried to make it easier to procure good bulls by buying such animals and making them over to interested persons, to be paid for usually by five yearly instalments, free of interest. As the instalments are usually paid by means of free tickets, a valuable animal can, it is stated, be obtained in this way without any cash payment at all.

After the close of the competition, it is customary for one of the jury to deliver a short lecture on it to the public ; these lectures prove of great value in consequence of the opportunity they afford of reference to living illustrations.

The interest excited by the competitions is shown by the fact that whereas up to 1890 the number of animals exhibited was about 10,000, the number in 1901 was 38,807. Of this number about three-fourths are "approved." The total cost of the system in 1901 was £11,780, one-third of which was contributed by the State. The number of competition places within each district is comparatively large, so that the area covered by the exhibition is sufficiently small as to be easily accessible to every one.

Lime-and-Sulphur Dip for Sheep.

Among the dips experimented with by Professor Winter for the Departmental Committee on Sheep Dipping was the lime-and-sulphur dip which has been successfully employed for the eradication of sheep scab in New Zealand and Australia. The dip was prepared by boiling together 25 lb. of sulphur, 12½ lb. of lime, and sufficient water until the solution was of a dark red-brown colour, decanting or straining the clear solution from an undissolved sulphur and lime, and making this liquid up to 100 gallons of the dip-bath. This dip caused the wool to have a somewhat bleached appearance for two or three

days after the dipping. As a scab dip it proved effective, but it seems to have had very little effect on the keds. The Report of the Bradford Conditioning House on the wool was as follows:—"Slightly discoloured, washes well, good handle, lofty wool, staple sound."

In this connection it may be of interest to note that a discussion on the efficacy of this dip took place in the Legislative Council of the Cape of Good Hope, when it was moved that "the lime-and-sulphur dip is the only reliable and effective remedy for the eradication of scab, and for that reason its use should be made compulsory under the provisions of the Scab Act." The value of the dip was generally admitted, and after considerable discussion it was unanimously decided that the dip should be strongly recommended under the provisions of the Scab Act as a reliable and effective remedy.

Maggots in Sheep.

A considerable amount of evidence was laid before the Departmental Committee on Sheep Dipping to the effect that the insects collectively known as "maggots" cause much trouble and loss to flock-masters, and several of the witnesses were of opinion that these pests are now found at higher altitudes than formerly. The Committee were not able to institute experiments to determine the species, mode of life, prevention and eradication of these insects, partly because the summer of 1903 was of such a character that maggots were much less in evidence than usual, so that conditions favourable to the conduct of experiments were not presented. Much useful information was, however, obtained from various witnesses, who were generally agreed that although dips of what may be called the carbolic type may destroy maggots actually present on sheep, they do little, if anything, towards warding off an attack. On the other hand, there was practical unanimity as to the preventive effect of sulphur, either dusted on dry, or conveyed to the fleece in the form of a dip in association with some other substance.

Admission of Pigs into Natal.

A proclamation was issued in the Natal Government *Gazette* of August 16th, 1904, prohibiting the importation, directly or indirectly, into the Colony of Natal of swine from the United Kingdom and from the Continent of Europe, except under the following conditions, viz.:—Healthy swine may be allowed to land provided they are certified by a veterinary inspector or surgeon to have come from a district guaranteed to have been free from swine fever for a period of six months prior to the issue of such certificate, and from a farm guaranteed to have been free from swine fever for a period of two years from the same date, and to be free from disease at the time of embarkation, and that they are first passed by an officer of the Natal Veterinary Department.

Water in Butter.

The amount of water in butter depends on a variety of circumstances, and when the subject was investigated by a Departmental Committee in 1901–2 it was shown that whilst creameries and factories in the United Kingdom are generally able to prevent an excessive quantity of moisture in their butter, difficulties arise, especially in the case of small producers who do not possess suitable buildings or modern appliances, and who are unable to obtain a supply of sufficiently cold water in hot weather. During the last two years the subject has attracted considerable attention abroad, and standards have been fixed in several countries besides our own. Various experiments have also been conducted, and the results have been published with a view to assist farmers to produce butter well within the statutory requirements as regards moisture. An enquiry of this nature was recently made by two experts at the Iowa Agricultural Experiment Station, and the results obtained indicate that the only conditions which materially influence the amount of moisture in butter are the temperature, the thickness of the cream, and the amount of churning.

Three experiments were made to test the effect of temperature. Three separate lots of cream were ripened in a vat,

and one half of each lot was churned at a high temperature (64°, 62°, and 60° F.), and the remainder at a low temperature (52°, 54°, and 48° F.). The temperature of the water employed for washing the butter was 58° F. in the first experiment and 60° F. in the second and third, but the other conditions of manufacture were as nearly as possible identical. It was found that the average percentage of water in the butter churned at the higher temperature was 13·83 per cent. compared with 13·24 per cent. in the case of the butter churned at the lower temperature, thus indicating that temperature, *per se*, has very little effect. It was, however, observed that whenever the churning temperature is high it is difficult, and in many cases impossible, to prevent overchurning, whereby the butter, when it is in a soft condition, incorporates moisture very rapidly. The moisture, moreover, is more readily retained than in the case of butter churned at a low temperature, as it is difficult to press out the liquid by "working."

Seven experiments were made in order to ascertain the influence of the percentage of fat in the cream, and it was found that in every case the butter made from the thicker cream contained a larger proportion of moisture. This is supposed to be due to overchurning, as it is almost impossible when thick cream is being churned under proper conditions to stop the churn while the butter is still in a granular condition.

Of all the means of controlling the moisture content of butter the most effective was shown to be the amount of churning, and that if it is carried to excess all other factors are subordinate and have little or no influence. The examination of samples of butter taken from the same churnings but at different stages—viz., from three to ten revolutions between each sample—indicated that overchurning increases the size of the butter granules. The moisture content of butter is thereby also increased, but gradually and to a small extent, whereas it is greatly increased by churning into lumps. In other words, the more butter is churned the more moisture it contains, especially if the butter is soft; and, as a rule, the larger the granules and the softer the butter, the more water remains in it.

The opinion that there is generally less water in pasteurised than in unpasteurised butter was corroborated by three experi-

ments, which gave an average of 1·7 per cent. less moisture in the butter made from pasteurised cream. Incidentally, it was found that the butter-milk from this cream contained in each instance more butter-fat than the butter-milk from the raw cream. It is surmised that the butter made from pasteurised cream contains less moisture, because pasteurisation tends to break up the clusters of fat globules which obtain in the raw cream, and the pasteurised cream consequently becomes thinner and less viscous.

The effect of the fulness of the churn was also investigated; and although the difference was small—the average of five experiments being .62 per cent.—it was found that the larger churnings yielded butter with less moisture. The reason is supposed to be due to the tendency of overchurning when dealing with a small amount of cream. If the temperature of the room is higher than that of the cream the smaller churning would also be more susceptible, since a high temperature, as well as overchurning, tends to increase the moisture content of butter. If, however, all other conditions are exactly similar the size of the churnings would appear to be immaterial.

It was also experimentally shown that the degree of ripeness of the cream has practically no influence in this connection.

Dairy Farming in Sweden.

Dairy farming is an industry of considerable importance in Sweden, and within the past thirty years it has been considerably developed, so that instead of being a butter-importing country, Sweden was able in the decade 1891–1900 to export an average quantity of 400,000 cwt. annually. The exports are sent almost entirely to England and Denmark, and in 1902 the quantity dispatched to the latter country was 199,000 cwt. and to the former 194,000 cwt. It is probable, however, that a considerable proportion of the amount sent to Denmark finds its way to England through the hands of Danish merchants. Owing, no doubt, to the increasing competition in this trade there has been some falling-off in the exports since 1896, when a total of 488,000 cwt. was reached. According to the British Trade

Returns the quantity imported into the United Kingdom in 1903 was 212,000 cwt.

Owing to the increased attention paid to dairying and the efforts made to improve the breeds of cattle, the number of stock in Sweden has steadily increased since 1870 from 1,966,000 to 2,583,000 in 1900. Foreign breeds have been largely imported, and at the present time the Ayrshire breed is distributed over the central and southern parts of the country, where Shorthorn herds are also found on many estates. The red-and-white Swedish cattle, more or less resembling Ayrshire and Shorthorn types, are also distributed over central Sweden, and a society has been established for the improvement of this breed with a herd-book in which 215 bulls and 2,838 cows were registered in 1903.

From an account of the dairy farming industry recently published by the Swedish Government, it appears that until about 1870 dairy farming was confined mainly to dairies on the large estates. At that time, however, dairy companies began to be established, which purchased milk and cream for conversion into butter, and in many cases maintained branches where the milk was collected only, the cream being conveyed to the central dairy. Early in the nineties co-operative dairies came into existence, owned and worked by a considerable number of small milk producers. These dairies have materially contributed towards enabling farmers who only produce small quantities of milk to turn their produce to the best advantage, and have made it possible to count dairy farming in Sweden as a manufacturing industry. In about 80 per cent. of the dairies butter alone is produced ; in rather more than 10 per cent. cheese alone ; and in the remainder both commodities are made. The total production of cheese, however, is scarcely sufficient for the home demand.

Dairies vary much in size, the quantity of milk dealt with daily ranging from, perhaps, 100 gallons to 6,000 gallons or more. In most cases, the dairies are very well constructed, with floors of asphalte, cement, limestone or slating, and are equipped with good machinery and appliances. The motive power is steam as a rule, though in some places water is employed. Dairy work has been largely done by women ; now, however, in the larger

concerns there are male managers, and for the most part, male hands.

Separators are almost universally employed, and the cream after becoming ripe is churned in the so-called Holstein churn; in a few of the larger dairies churns of new types have been introduced to enable larger quantities of cream to be treated at a time. The butter is nowadays worked almost exclusively by mechanical butter-workers. After the first working the butter is salted and worked afresh, after having lain in a sufficiently cool place long enough for the salt to melt. In the manufacture of butter for export, the cream is subjected to a special souring process, much improved of late years by the employment of vessels of tinned sheet metal and by the use of carefully prepared souring agents, in the production of which pure-cultures are used in many dairies. Unsalted or fresh butter is only prepared in small quantities for local requirements. When salted and worked, the butter is packed in kegs of about 1 cwt. In a few dairies the butter is occasionally made up into rolls, wrapped in parchment paper and packed in boxes of 56 lb. Refrigerator chambers are used for the storage of the butter between the workings and after packing, and in some places the new milk, or the cream and the skimmed milk separately, is pasteurised.

With regard to the disposal of the by-products the co-operative dairies have the advantage of being able to return the skimmed milk, etc., to the farmers by whom it is employed for food, for the manufacture of cheese, for calves and pigs.

Milk is usually weighed, and payment is dependent on the price of butter, though the system of payment according to the percentage of fat in the milk has also been adopted. The amount of fat in the milk is now calculated by the butyrometer. To facilitate the calculation of prices, as they vary, the Swedish Dairy Experts' Association publish monthly tables based on the percentages of fat and the butter prices. Payments for the butter received and delivered are made every week, the prices being ruled mainly by the quotations of the Copenhagen market. The dairies despatch their produce once a week, as a rule, to the centres of export, many railways providing special refrigerator cars during the summer.

The State and the Agricultural Societies endeavour in many

ways to foster and support the dairy farming industry. The Government has appointed an Instructor, and also maintains an agent in England to superintend and assist the export of dairy produce from Sweden. The State also provides instruction in this branch of agriculture in both the higher and lower agricultural schools, and grants pecuniary aid to butter-testing and cheese exhibitions. The agricultural societies appoint migratory teachers, and give exhibitions and grants to schools. The migratory teachers, now styled dairy experts, are generally men, but some of the societies have dairy-instructresses as well.

Milk and Butter Sampling.

The question of milk adulteration and the taking of samples for analysis under the Sale of Food and Drugs Acts has been attended with certain difficulties which have tended to reduce the number of samples taken in certain quarters. One of these difficulties, as is pointed out in the Annual Report of the Intelligence Division of the Board of Agriculture and Fisheries for 1903,* has arisen from the practice of some County Councils of arranging with the Urban District Councils for samples taken by the sanitary inspectors of the District Councils to be submitted to the Public Analyst appointed by the County Council—the expense of analysis being defrayed wholly or in part by the County Council. As, however, the question has been raised as to whether the County Council is justified in paying the expenses in connection with samples taken by an officer not under its direction, some modification of arrangements has been necessary in certain districts. In Essex, the Urban District Councils have for the most part ceased to take samples, since it has become necessary for them to bear the whole cost of analysis. Similar complications have affected the execution of the Acts in the county of Durham.

A second circumstance which has helped to check the activity of sampling officers is the difficulty of dealing with milk adulteration. Formerly, the Public Analyst of any district

* [*Cd.* 2187. *Price* 3*d.*]

had a standard of his own, and could condemn all samples failing to meet it, but at present the information made public through the medium of the Report and the Minutes of Evidence of the Committee on Milk and Cream Regulations, offers temptation to make a prosecution for alleged adulteration a field for a mass of expert evidence on both sides.

So great is the uncertainty created in the minds of magistrates that many Courts are unwilling to convict in any case of alleged adulteration. For this reason the seller of genuine milk is liable to be undersold by the dishonest vendor who carries on his trade with impunity. This has caused some local authorities to try and avoid the difficulty by what is known as the "appeal to the cow"—a sample being traced to its origin and a new one taken. Recent investigations, however, tend to show that considerable changes may occur in the quality of the milk of a mixed herd before such sample could be obtained, even within the forty-eight hours as arranged in the county of Durham. Pending further investigations, therefore, the adoption of this system is not recommended.

The necessity for systematic sampling, however, is well illustrated by a case which occurred in London, where, owing to the illness of an inspector sampling was temporarily suspended. An unexpected return to work on the part of the inspector elicited the fact that advantage had been taken of his absence to trade in milk which had been doctored; 12 samples out of a total of 22 being unfavourably reported on, an increase of some 32·8 per cent.

Attention is also called in the same Report to the issue to local authorities of a circular respecting the collection of butter samples and the analysis of samples of sour milk.

With regard to the sampling of imported butter the annual report* of the Principal Chemist of the Government Laboratory for the year ended 31st March, 1904, states that out of 2,524 samples analysed for the Board of Agriculture, 2,046 were samples of imported butter. Of this number 41 per cent. were found to contain boron preservative compared with a proportion of 33·4 in the preceding year. The proportion of samples containing colouring matter increased from 19 to 32

* [*Cd.* 2144. *Price* 3*d.*]

per cent. One sample was found to contain water in excess of the limit of 16 per cent. Proceedings were taken against the importer, which resulted in a conviction and penalty of £10. In the case of imported milk and cream, 189 samples were analysed. Three samples of sweetened condensed milk from Holland were reported as "machine skimmed" not so labelled, and one was found deficient in fat. Proceedings have been taken in each case.

Inspection of Food Imported into the United States.

The United States Legislature has recently fixed a series of standards* as to the purity, strength, and character of foods and drugs, and means have been provided for the investigation of imported articles which are falsely labelled or branded, or suspected of being dangerous to the public health. Packages containing such articles may be opened and samples taken for inspection and analysis, and if the report is unfavourable delivery to the consignee may be refused. In order to avoid delay in the inspection of imported products, the Department of Agriculture has requested importers to observe that foods, beverages, condiments, and "ingredients of such articles" are now subject to inspection, the object of which is to ascertain whether the products are injurious to health, whether they are falsely branded or labelled as regards contents or place of origin, and whether their entry is forbidden there or sale restricted in the country where they are made or from which they are exported.

Food will be considered adulterated when (in the absence of contrary judicial interpretation) any valuable ingredient which it naturally contains has been abstracted, or if a less valuable one has been substituted; or if the food product is coloured, powdered, or polished, with intent to deceive, or to make it appear of a better quality than it really is; or if it is a substitute for or an imitation of a genuine article and is offered under the name of that article. Products will be similarly considered as injurious to health if they are decomposed, filthy, decayed, or

* See *Journal of Board of Agriculture*, Vol. XI., p. 31.

otherwise unfit for human consumption ; or if any substance has been added which is injurious to health, as determined by actual experimental evidence or in the predominating opinion of scientific experts. Well-known "condimental substances," such as common salt, spices, sugar, wood-smoke, and vinegar are not prohibited.

If the label bears, directly or by implication, a false name or contains any false statement relating to the place of origin of the goods, or that they are not of the nature and quality commonly associated with the name under which they are sold, the products will be regarded as misbranded. Importation is prohibited of products which are forbidden entry in the country where they are manufactured, or from which they are exported ; or if their sale is prohibited or restricted therein.

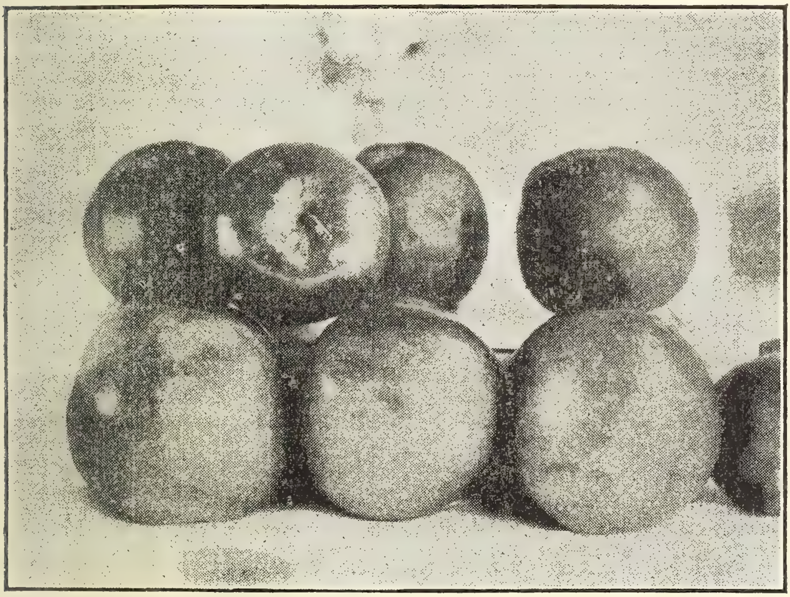
American importers are urged to request their agents abroad to comply with these official regulations, which are summarised as follows: Freedom from deleterious substances, rectification of added foreign substances, and truthfulness in labelling.

Planting of Fruit Trees.

At a time when fruit trees are being planted it may not be amiss to call attention to a method that has recently been practised in some parts of Germany, with, it is said, conspicuous success. On strong clay soil it is known that the roots of trees often suffer through lack of air, and this difficulty may be largely avoided by interstratifying the soil beneath the roots with layers of hedge brushings or similar material. A hole, two to three feet deep and twice this in width, is first made, in the bottom of which some six inches of brushings are placed. On this a layer of soil of similar depth is deposited, then another layer of brushings, and, finally, the tree is set in and secured in the usual way. Trees so treated are said to make very vigorous growth, and to have great power of resisting drought and other prejudicial influences.

Green Colouration in Apples.

The attention of the Board was recently drawn to a peculiar green colouration which appeared in some apples grown in Suffolk. The varieties were Lane's Prince Albert and Alfriston, taken from trees six years old, but fruit grown on neighbouring trees did not show the peculiarity in question. It appears that the green colouration of the flesh is not the result of a disease, but the outcome of a tendency to depart



from the typical condition of the fruit under certain unknown conditions. Professor Mayr, of Munich, states that a similar condition of things is not uncommon in Germany, and the fruit thus altered is known as "clear apples." The appearance is similar to that produced by freezing. Professor Mayr states that in Russia this tendency to variation of the fruit is encouraged, and when the entire fruit becomes so changed its flavour is much improved.

This disease is due to the presence of a minute parasitic fungus called *Coniothyrium diplodiella*. On the Continent it attacks vines growing in the open air, and during recent years has frequently been met with on vines growing under glass in this country.

"White Rot" of Vines.

The fruit is the part most frequently attacked, and in severe cases the fungus spreads from the stalk of the bunch of fruit to the branch from which it springs; the foliage is unaffected. When once established, the disease spreads rapidly, and usually every grape on a bunch becomes diseased, owing to the numerous minute spores of the fungus being conveyed by rain, syringing, &c., from diseased to healthy berries. During the first stage of disease the berries become pale brown in colour, and soon commence to shrivel, but do not fall. At a later stage, when the shrivelled berries have become dry, the skin is covered with minute whitish pimples representing the fruit of the fungus.

When the stalk of a diseased bunch is attacked, the fungus often passes on to the branch, where it forms slightly depressed areas, which are at first brownish in colour, but afterwards studded with the characteristic white pustules of fungus fruit. The diseased patches may extend for several inches down one side, or the branch may be completely girdled by a zone of diseased tissue, and if this is the case that portion of the branch above the injured zone soon dies. In vineyards the disease is most injurious during seasons of great humidity accompanied by warmth. Under such conditions one-quarter to one-third of the crop may be destroyed within the space of a few hours.

The best remedy is to remove and burn all diseased bunches of fruit, and spray every part thoroughly once every five days with a rose-red solution of permanganate of potash.

If the disease is of recent origin and confined to the bunches of fruit, the above treatment will suffice. If, however, the disease has spread to the branches, its presence will be indicated by the slightly depressed whitish patches on the bark already mentioned. All such diseased branches should be cut out, as spraying will not check the disease on permanent parts of the vine.

The Black Currant Gall-Mite.

Experiments have been carried out from time to time with a view to discovering a cure for the Currant Gall-Mite infestation, which is dealt with in the Board's Leaflet No. 1. The subject has recently been investigated by Mr. W. E. Collinge, M.Sc., Lecturer in Zoology at the University of Birmingham. In 1901 Mr. Collinge sprayed some small bushes, which were badly infested, twice a week with a solution composed of:—Sulphur, 2 lb.; soft soap, 25 lb.; water, 50 gals. The sulphur was made into a gruel with water, the soap mixed with 5 gallons of boiling water, and the two mixtures added together and well stirred, after which sufficient water was slowly added to make 50 gallons. The results obtained were very encouraging, mites being found on fresh buds only on one bush in 1901. In 1902 no mites were discoverable on the bushes, but being near some infested bushes they were again sprayed. In 1903 they were still free of the mites, and also early in the present year no trees bore abnormal buds. The experiments were on a small scale, but it is proposed to continue them on a larger scale.

A small amount of success has also been obtained by hand-picking infested buds in small isolated plots, but it is strongly recommended that all infested stock should be burnt, and the utmost care should be taken only to replace them with cuttings after conclusive evidence that these are not infested. The Board will be glad to receive any information concerning experiments made with the spray mentioned above.

The Colorado Beetle in Hereford.

The Board think that a brief account of the circumstances connected with the discovery of some specimens of the Colorado Beetle in Herefordshire may be of interest to agriculturists.

During the first week of July two beetles were left by a stranger at the Free Library in Hereford. Subsequently it was suspected that they were Colorado Beetles, and the circumstances were reported to the police, who communicated with the Board, to whom the two

insects were at the same time submitted. On examination the suspicions as to the identity of the insects were confirmed.

Considerable difficulty was experienced in tracing the person who left the beetles at the library, but the police, in conjunction with the Board's inspectors, made very searching enquiries, which were eventually successful. It was found that the beetles in question were the sole survivors of a lot of several which had been brought over from the United States as a curiosity to show to relatives and friends, and not with the intention of liberating them ; that no eggs or larvæ had been imported ; and that the dangers attending the introduction of the insects into this country had been recognised and guarded against.

From subsequent enquiries, the Board are satisfied that no further apprehension need be feared in this particular case, though the practice of importing live destructive insects even for perfectly innocent purposes is associated with considerable danger. In the case of the Colorado Beetle severe penalties attach to the keeping of live specimens in this country.

Exhibit of Insect Pests at St. Louis.*

A section of the U.S.A. Division of Entomology was established and organised in 1902 for the purpose of making forest insect investigations, its object being to conduct original research, to determine the chief enemies of forest trees, and especially to work out the life-histories, distribution, and natural enemies of such pests. One of the results of the work of this section is a collection of specimens and material made since 1902, which comprises an important part of the Insect Exhibition at St. Louis. The object of the exhibit is to show the character of the destructive work of forest insects, to illustrate this by means of special examples of the pests themselves, whilst at the same time insects which are beneficial on account of their parasitic or predaceous habits are not omitted. The number of insect specimens in this section amounts to nearly 800, whilst there are 623 specimens of destructive work and a

* Bulletin No. 48, U.S.A. Department of Agriculture.

set of photographs. A large part of the material is the first of its kind collected, and many of the descriptions are original. The importance of a study of insect ravages will be realised when it is stated that it has been estimated that the average annual losses to forestry in the United States due to insect ravages amount to no less a sum than 20 millions sterling (£20,000,000).

Importation of Plants into Cape Colony.

New regulations as to the importation of trees, plants, &c., into Cape Colony are gazetted under Proclamation No. 138, 1904 (Cape Colony), and are to take effect from September 1st, 1904. These regulations are substantially similar to those noted in the Board's *Journal* for September, 1903, p. 260, but with some extensions. The importation of coniferous plants, or any portion thereof, with the exception of seed, is absolutely prohibited, as is also timber with the bark on, except scaffolding poles shipped from the Baltic or from Canada. Articles subject to these regulations introduced into the Colony by post will be intercepted and examined by an officer appointed for the purpose; and if found infested with any noxious insect or plant disease must be cleansed or destroyed. Ordinances have also recently been passed both in Southern Rhodesia and the Transvaal with a view to regulating the introduction of plants likely to disseminate insects.

In a memorandum* explanatory of these revised plant import regulations, the Cape Government Entomologist observes that the conditions in South Africa, more than in most parts of the world, justify drastic restrictions on plant imports as a means of minimising the introduction of fresh plant pests. It is a comparatively new country, from an agricultural standpoint, with sea connection only with the rest of the civilised world. The over-sea trade in living plants is still small, and there is no reason why the country cannot grow sufficient nursery stock of all kinds to keep pace with its requirements. Above all, the

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* *Agricultural Journal of Cape of Good Hope*, June, 1904.

introduced pests of the orchard and vineyard are comparatively few in number, and some of the worst are still restricted in their occurrence. Cape Colony aspires to be a fruit and wine exporting country, and therefore the exclusion of fresh pests is a matter of vital importance.

The general principle of the plant import regulations in the past has been the inspection of imports at the landing place, and their suitable treatment should they be found to be accompanied by any insect or plant disease "the introduction of which would be prejudicial to the interests of the Colony." Regulations based on this principle alone have, it is observed, a very grave weakness, which is the utter impracticability of adequately examining for insects, plant consignments of any size without subjecting them to ruinous treatment through exposure and delay; inspection, moreover, is no safeguard against most plant diseases.

These regulations have now been materially strengthened by the absolute prohibition of certain plants which are considered especially dangerous, and by restrictions on the importation of other kinds. The fumigation of all trees and woody plants is now required, and fumigation chambers are provided at the three principal ports. The fumigation is with hydrocyanic acid gas, and is a precautionary measure against inconspicuous scale insects.

Sampling under Fertilisers and Feeding Stuffs Act.

The following circular has been addressed by the Board to local authorities in Great Britain in connection with the Fertilisers and Feeding Stuffs Act, 1893:—

Board of Agriculture and Fisheries,
4 Whitehall Place, S.W.,
September 26th, 1904.

FERTILISERS AND FEEDING STUFFS ACT, 1893.

SIR,—I am directed by the Board of Agriculture and Fisheries to say that they think it desirable to bring under your notice the satisfactory results which have been obtained in the county of Lindsey (Lincs.) as the result of certain

arrangements made by them for sampling manures and feeding stuffs under the Fertilisers and Feeding Stuffs Act, 1893.

The Lindsey County Council approved two of their inspectors as authorised representatives of the District Agricultural Analyst, and directed them to inquire, in the first place, what kinds of fertilisers and feeding stuffs were being used in the county. In cases where they thought it desirable that an article should be tested, they were instructed to obtain the consent of the buyer and to take samples, the sampling and the subsequent analysis being done at the expense of the Council.

A number of samples were then taken with a view of ascertaining the existence of fraudulent practices, and in certain cases where the Council were satisfied that a reasonable prospect of conviction existed, proceedings were taken against the vendors by the inspectors at the direction of the Council.

The number of samples taken, and the result of the analysis as stated by the District Agricultural Analyst, together with the cases of prosecution, were as follows:—

Period.	Description of Sample.	Result of Analysis.			No. of Prosecutions.
		Genuine.	Doubtful.	Adulterated.	
1st Quarter ...	8 Cotton cakes ...	2	—	6	2
	7 Linseed cakes ...	4	3	—	—
	2 Feeding cakes ...	1	1	—	—
	1 Fertiliser ...	1	—	—	—
2nd Quarter ...	8 Cotton cakes ...	6	—	2	2
	4 Linseed cakes ...	1	1	2	2
	2 Feeding cakes ...	—	2	—	—
3rd Quarter ...	8 Cotton cakes ...	6	1	1	1
	6 Linseed cakes ...	2	2	2	1
	1 Feeding cake ...	1	—	—	—
	9 Fertilisers ...	9	—	—	—

In the eight prosecutions, seven convictions were obtained and one case was dismissed. The fines imposed were in one case £5 and costs, in five cases £10 and costs, and in another case £20 and costs.

Having regard to the decision lately given by a Divisional Court of the High Court of Justice in the case of Korten *v.* The

West Sussex County Council, the prosecutions were undertaken by the Lindsey County Council under the provisions of Section 7 of the Act. The judges in this case unanimously decided that proceedings can be taken by a County Council under the Fertilisers and Feeding Stuffs Act, 1893, although the provisions of the Act as to the taking of samples and the analysis by the District Analyst have not been followed, *i.e.*, that compliance with these provisions is not a condition precedent to a prosecution. It was thus possible for proceedings to be taken in cases where, without notice having been previously given to the sellers, samples were taken by the officers of the County Council.

The procedure adopted by the Lindsey County Council appears to the Board to be of the greatest value in securing the more efficient enforcement of the Fertilisers and Feeding Stuffs Act, and I am to suggest to your local authority the desirability of considering whether similar arrangements could be made in your district.

I am, &c.,

T. H. ELLIOTT,

Secretary

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of September, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	8 0	7 7	38 5	35 2
Herefords	7 8	7 3	—	—
Shorthorns	7 9	7 3	37 8	34 6
Devons	8 0	7 4	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	7¾	7	8¼	6½
Sheep :—				
Downs	8½	8	—	—
Longwools	8	7½	—	—
Cheviots	8¼	8	8¾	7¾
Blackfaced	8½	7¾	8½	7¾
Cross-breds	8½	7¾	9	8¼
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	5 10	5 6	5 7	5 0
Porkers	6 4	6 0	6 4	5 6
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
In Milk	21 7	18 4	20 10	16 14
Calvers	19 19	17 6	19 9	16 0
Calves for Rearing	2 2	1 13	1 10	1 2
Store Cattle :—				
Shorthorns—Yearlings ...	8 17	7 14	9 15	8 1
,, Two year-olds	12 12	11 12	14 9	12 10
,, Three-year-olds	15 17	14 5	17 1	14 19
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools—Hoggs, Hoggets, Tegs and Lambs	34 6	30 0	—	—
Scotch Half-breds ,, ...	—	—	29 9	25 3
Store Pigs :—				
Under 4 months	23 9	17 9	25 3	17 9

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of September, 1904.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	53 8	51 7	49 0	50 2	56 0*	54 10*
	2nd	51 4	45 4	45 6	43 2	53 8*	47 10*
Cow and Bull ...	1st	—	44 0	44 4	43 2	45 6	39 8
	2nd	—	37 7	40 10	38 6	40 10	35 0
U.S.A. and Canadian :— Birkenhead killed	1st	51 4	48 8	46 8	47 10	—	50 2
	2nd	46 8	41 5	40 10	39 8	42 0	45 6
Argentine Frozen Hind Quarters ...	1st	29 2	31 6	31 6	30 4	35 0	35 0
American Chilled Hind Quarters ...	1st	49 0	50 5	49 0	49 0	51 4	52 6
VEAL :—							
British	1st	67 8	63 3	64 2	64 2	—	67 8
	2nd	60 8	51 4	57 2	51 4	—	—
MUTTON :—							
Scotch	1st	74 8	67 8	72 4	74 8	74 8	72 4
	2nd	68 10	51 4	64 2	66 6	65 4	54 10
English	1st	66 6	68 6	70 0	72 4	—	—
	2nd	60 8	53 8	59 6	64 2	—	—
Argentine Frozen ...	1st	36 2	35 3	35 0	35 0	35 0	36 2
LAMB :—							
British	1st	73 6	67 11	74 8	72 4	75 10	74 8
	2nd	66 6	60 8	67 8	64 2	67 8	61 10
New Zealand ...	1st	54 10	55 8	56 0	56 0	57 2	—
	2nd	52 6	54 3	—	53 8	—	—
PORK :—							
British	1st	59 6	57 5	59 6	53 8	49 0	50 2
	2nd	49 0	48 1	53 8	46 8	46 8	44 4

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each of the under-mentioned Weeks in 1904, and in the corresponding Weeks in 1903 and 1902.

Weeks ended (*in* 1904).	Wheat.			Barley.			Oats.		
	1902.	1903.	1904.	1902.	1903.	1904.	1902.	1903.	1904.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 2 ...	27 7	25 0	26 3	26 7	23 11	22 1	19 10	16 10	15 5
,, 9 ...	27 8	24 11	26 6	26 7	24 1	22 6	20 0	17 0	15 7
,, 16 ...	27 8	24 11	26 11	26 11	24 1	22 3	20 0	16 10	15 9
,, 23 ...	27 7	25 0	27 3	26 7	24 1	22 4	20 3	16 11	15 11
,, 30 ...	27 4	25 4	26 11	26 7	24 3	22 3	20 2	17 0	15 8
Feb. 6 ...	27 2	25 6	26 9	26 9	23 9	22 4	20 3	16 11	15 11
,, 13 ...	26 11	25 6	26 8	27 5	23 7	22 2	20 3	17 1	15 9
,, 20 ...	27 1	25 4	26 11	26 11	23 4	22 7	20 4	17 1	16 0
,, 27 ...	27 1	25 3	27 10	26 8	23 2	22 4	20 5	17 1	16 3
Mar. 5 ...	27 0	25 3	28 8	26 8	23 1	22 6	20 5	17 1	16 5
,, 12 ...	27 1	25 1	29 1	26 6	22 10	22 5	20 6	17 0	16 8
,, 19 ...	27 1	25 1	28 6	26 4	22 9	22 9	20 6	16 10	16 7
,, 26 ...	27 2	25 2	28 2	27 2	22 4	22 8	20 7	17 0	16 7
Apl. 2 ...	27 3	25 3	27 11	26 5	22 6	22 10	20 6	17 0	16 6
,, 9 ...	27 5	25 4	27 10	26 7	21 10	22 5	21 0	17 2	16 5
,, 16 ...	27 7	25 6	27 9	27 1	21 6	22 6	21 1	17 3	16 4
,, 23 ...	28 9	26 1	27 9	26 5	21 9	22 0	21 6	17 9	16 4
,, 30 ...	29 9	26 10	27 8	27 5	22 1	21 1	21 10	18 0	16 3
May 7 ...	30 9	27 6	27 4	26 10	21 10	20 8	22 6	18 2	16 7
,, 14 ...	31 1	27 9	27 1	25 3	22 5	19 10	22 5	18 4	16 6
,, 21 ...	31 6	27 10	26 9	25 4	23 7	20 4	22 6	18 5	16 7
,, 28 ...	31 6	27 8	26 9	25 1	23 7	19 8	22 10	18 5	16 7
June 4 ...	31 3	27 6	26 10	24 3	23 10	18 8	22 11	18 4	16 8
,, 11 ...	30 11	27 8	26 6	23 8	21 5	18 5	22 8	18 7	16 10
,, 18 ...	30 6	27 6	26 5	23 5	20 7	18 2	23 0	18 3	16 8
,, 25 ...	30 5	27 6	26 5	24 3	22 0	19 2	22 9	18 6	16 10
July 2 ...	30 8	27 9	26 4	25 5	20 7	18 8	22 5	18 6	17 1
,, 9 ...	30 10	28 1	26 6	24 8	19 11	19 8	22 10	18 3	17 1
,, 16 ...	30 11	28 3	26 10	23 8	20 5	18 9	22 10	18 7	17 6
,, 23 ...	31 5	28 7	27 7	25 0	20 10	18 10	22 8	18 5	17 6
,, 30 ...	31 8	28 11	28 0	25 0	21 0	19 9	22 10	18 6	17 10
Aug. 6 ...	31 7	29 3	28 3	24 11	20 1	19 9	22 11	18 8	17 10
,, 13 ...	31 7	29 11	28 4	24 9	21 3	19 9	22 2	18 10	17 7
,, 20 ...	31 5	29 9	28 8	22 10	20 4	22 5	21 11	18 6	16 7
,, 27 ...	31 7	30 0	29 5	26 2	22 3	23 2	21 0	18 7	16 5
Sept. 3 ...	29 9	30 3	30 2	24 6	22 5	25 3	19 10	18 5	16 3
,, 10 ...	27 10	28 6	30 0	27 5	22 4	24 10	19 2	17 0	16 1
,, 17 ...	27 1	27 5	29 7	26 4	24 2	24 9	18 4	16 4	15 11
,, 24 ...	26 6	27 0	29 10	26 4	24 0	25 10	18 0	16 2	15 9
Oct. 1 ...	25 10	26 3	29 10	25 11	23 9	25 5	17 5	15 9	15 8
,, 8 ...	25 5	25 10	30 2	26 2	23 8	25 6	17 2	15 6	15 9
,, 15 ...	25 1	25 8		26 1	23 9		17 0	15 5	
,, 22 ...	24 11	25 10		26 4	23 7		17 0	15 8	
,, 29 ...	25 0	26 0		26 7	24 2		17 3	15 8	
Nov. 5 ...	25 1	26 4		26 3	24 3		17 2	15 9	
,, 12 ...	25 0	26 6		25 11	24 6		17 3	15 9	
,, 19 ...	24 11	26 9		25 6	24 3		17 2	15 10	
,, 26 ...	25 0	26 6		24 11	23 11		17 0	15 11	
Dec. 3 ...	25 1	26 8		24 4	23 9		17 0	15 9	
,, 10 ...	25 0	26 7		24 3	23 2		16 10	15 9	
,, 17 ...	24 10	26 9		24 2	23 0		16 10	15 7	
,, 24 ...	24 10	26 5		24 1	22 5		16 8	15 6	
,, 31 ...									

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1903.	1904.	1903.	1904.	1903.	1904.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	August ...	38 11	36 2	23 4	21 11	18 0	16 10
	September ...	36 2	37 5	22 7	22 7	17 4	17 4
Paris:	August ...	40 0	37 9	23 10	22 2	18 4	18 8
	September ...	36 4	38 7	23 2	23 7	17 6	19 0
Belgium:	July ...	29 11	29 10	21 11	20 8	18 1	19 2
	August ...	28 10	30 0	22 11	21 6	19 8	19 4
Berlin:	July ...	36 11	37 10	—	—	18 3	20 0
	August ...	35 9	39 0	—	—	19 10	20 8
Breslau:	July ...	32 1	38 3	22 10	23 2	17 11	18 8
	August ..	33 11	38 0	22 10	24 7	17 10	18 9

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets.*

AVERAGE PRICES of **British Wheat, Barley** and **Oats** at certain Markets during the Month of September, 1903 and 1904.

—	Wheat.		Barley.		Oats.	
	1903.	1904.	1903.	1904.	1903.	1904.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	28 11	30 8	23 1	25 8	17 5	16 8
Norwich	28 11	29 11	23 1	25 11	15 9	15 4
Peterborough ...	26 1	29 5	22 0	23 7	15 0	15 3
Lincoln	26 9	29 5	22 11	23 4	16 8	15 6
Doncaster	27 10	29 0	25 6	23 6	17 8	16 8
Salisbury	27 11	29 6	22 0	24 0	17 2	16 9

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of September, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British... ...	13 1	12 0	—	—	—	—	13 6	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	104 6	102 6	105 0	99 9	102 0	99 0	104 3	102 3
Danish ...	120 0	118 6	121 0	116 0	119 6	116 9	117 7	—
Russian ...	94 0	90 0	—	—	92 6	85 0	92 0	85 4
Australian ...	103 6	96 0	—	—	—	—	108 0	—
New Zealand...	101 6	98 0	—	—	—	—	—	—
Canadian ...	97 6	92 0	99 0	94 6	97 9	95 0	100 0	95 3
CHEESE :—								
British Cheddar	63 0	57 0	—	—	66 0	60 0	55 0	51 6
			120 lb.	120 lb.	120 lb.	120 lb.		
,, Cheshire	66 0	64 0	59 4	50 0	61 0	53 6	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	44 0	42 0	44 9	42 0	43 6	42 0	44 6	42 3
BACON :—								
Irish	61 9	56 6	62 3	58 9	62 3	59 6	61 9	57 0
Canadian ...	56 9	51 3	57 0	52 0	55 0	53 6	54 0	51 6
HAMS :—								
Cumberland ...	99 0	85 6	—	—	—	—	—	—
Irish	96 0	86 6	—	—	—	—	102 0	92 0
American ...	51 9	49 0	53 4	50 0	51 9	48 6	52 6	49 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	12 0	10 0	—	—	—	—	—	—
Irish	11 6	9 0	10 0	8 4	9 4	8 8	8 9	8 1
Danish ...	10 3	8 10	10 5	8 7	9 11	9 5	9 0	7 10
	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
POTATOES :—	73 0	62 3	57 4	47 0	54 5	42 6	56 8	—
HAY :—								
Clover... ...	85 0	74 0	83 9	67 5	80 0	75 0	66 3	61 3
Meadow ...	80 0	69 6	66 6	48 6	57 6	45 0	—	—

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	September.		9 Months Ended September.	
	1904.	1903.	1904.	1903.
Swine-Fever :—				
Outbreaks	42	76	1,038	1,185
Swine Slaughtered as diseased or exposed to infection ...	277	452	4,853	6,140
Anthrax :—				
Outbreaks	74	40	742	585
Animals attacked	106	55	1,162	887
Glanders (including Farcy) :—				
Outbreaks	130	124	1,198	1,150
Animals attacked	239	254	2,118	1,937
Sheep-Scab :—				
Outbreaks	23	26	963	1,118

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	September.		9 Months Ended September.	
	1904.	1903.	1904.	1903.
Swine-Fever :—				
Outbreaks	24	16	175	145
Swine Slaughtered as diseased or exposed to infection ...	613	260	3,707	3,137
Anthrax :—				
Outbreaks	1	—	3	2
Animals attacked	1	—	3	3
Glanders (including Farcy) :—				
Outbreaks	1	—	9	2
Animals attacked	1	—	30	3
Rabies (number of cases) :—				
Dogs	—	—	—	2
Sheep-Scab :—				
Outbreaks	*5	*2	*371	*397

* These figures refer to August, and to the periods ending August, respectively.

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THE JOURNAL

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NOVEMBER, 1904. [NEW SERIES.]

PLANTING FRUIT TREES AND BUSHES.

November, of all periods of the year, is the best month for the planting of fruit trees and bushes. The leaves have then fallen, and the soil is always moist enough, while it is less likely to be too wet than at a later period of the season. Planting may be carried on, however, all through the winter, and even in the early part of the spring, before the buds have started in growth, whenever the land is in a suitable condition—that is, free from excessive wetness and frost.

Although soils over the Old Red Sandstone, the Greensand, or the Lias, or deep alluvial soils are among the best for fruit, satisfactory results can be obtained on any land that will grow corn, clover, and potatoes well. Stiff clays, very shallow soils of any class, and burning sand or gravel soils are to be avoided. A slope towards the south or south-east is best, though the south-west will do if natural or artificial shelter protects the trees against the gales from that quarter ; but there are many good orchards on level plains, and some with aspects which are not such as would have been selected if full liberty of choice had been available.

Preparations for planting should be made much earlier than November, as the land must be drained if water is likely to stagnate in it, and it needs to be thoroughly cultivated before the holes for trees and bushes are dug. Land in which an early potato crop has been grown, or a crop of peas, comes in well for planting, as there is time after getting either off the field to allow of the necessary cultivation. Potatoes are usually manured heavily, and when they are raised early the land is commonly

in a friable condition; and the pea crop is an accumulator of nitrogen.

The first operation should be surface cultivation to kill weeds, followed, if necessary, by the application of a dressing of farmyard manure over the whole of the land. Next come ploughing and subsoiling, unless the land is to be dug with a spade, and in that case what is called bastard trenching is essential. This consists in the ordinary digging of the top spit and the stirring of nine or ten inches below it with a spade or a fork without turning the soil on to the surface. Such work is usually regarded as too costly for planting on a large scale, for which the subsoiling is best done by a steam cultivator, stirring the soil in two operations as nearly to the depth of two feet as possible. Where a steam cultivator is not available, a subsoil plough, following an ordinary plough, is commonly used.

The make-shift plan of merely digging holes for trees in land not deeply cultivated is a bad one, no matter to what depth the soil in the holes is stirred. This is particularly the case where the subsoil is retentive, the holes merely becoming wells for water to drain into. When trees are to be planted in permanent pasture this plan is the only one feasible; but in such a case a drain, deeper than the bottoms of the holes, should be laid between each two rows. The holes should be six feet wide each way, and the soil of that space should be kept cultivated for some years after planting, until the trees are well grown. Experiments on the Duke of Bedford's Fruit Farm, near Woburn, have proved that nothing is so deleterious to the growth of young fruit trees as letting grass grow closely around them.

Before the holes are dug it is necessary, of course, to decide what is to be planted in them. In most recently-planted orchards for market purposes half-standard or bush apples or plums, with gooseberries or currants between them, are grown. Less commonly, tall standard apples, with bush apples or plums or pyramid pears between them, have been planted. Half-standards or bushes are much more convenient for pruning, spraying, and picking than tall standards, and for that reason are generally preferred. If it be intended to cultivate a plantation with horses for some years at least, thus effecting a great saving in the labour of keeping the land clean, half-standards

are preferable to bush trees. On the other hand, bush trees on the paradise stock come more quickly into bearing than half-standards, which are usually on the crab or free stock. Again, gooseberries or black currants become profitable much sooner than apples, plums, or pears, and therefore they are most commonly planted as bottom fruit.

The distances desirable between trees and bushes vary with the character of the soil, and, so far as trees are concerned, with strength and habit of growth. But, if horse cultivation is to be pursued, this may modify the decision as to distances. On rich soil, full standards should not be less than 24 ft. apart each way, whereas 20 ft. may do on poor land. Similarly, half-standards may be 15 to 20 ft. apart, according to the character of the soil and the varieties, while bush trees on the paradise stock may be from 10 ft. to 12 ft. apart. The distances of the bottom fruit bushes will be multiples of those of the trees. For example, if the trees are 18 ft. or 24 ft. apart, the bushes will be 6 ft.; if the former are 15 ft. or 20 ft. apart, the latter will be 5 ft. For horse cultivation, however, 6 ft. from bush to bush or from bush to tree is preferable to 5 ft. Some varieties of apples and plums are much stronger growers or more spreading in habit of growth than others, and modification of distances to suit these differences is possible without interfering with the multiple of 6 ft. from bush to bush or from bush to tree. For example, if standards or half-standards are planted 24 ft. apart in the rows, those of strong growth or spreading habit may be the same distance from row to row, while trees of weak growth or upright habit may be only 18 ft. from row to row. In either case, the gooseberries or currants will be 6 ft. from each other or from a tree.

It is advisable, however, to refrain from planting trees of weak growth altogether on poor soil, and in that case no modification is desirable. In the case of planting bush trees, moreover, if horse cultivation is to be pursued for a time, no modification from the 12 ft. distance can be recommended, as 18 ft. would be too wide in either direction. For horse cultivation it is of great importance to have the rows of trees and bushes perfectly straight in each direction and the distances precisely kept, in order that the cultivation may be done across as well as up and down. The best way to insure this result is to mark out the

field in both directions with a light plough, such as a double-breasted plough used for ridging. This should be done at the distance of tree to tree, and then a tree hole can be dug at each place where the transverse lines cross, while the place for each bush hole can be determined by measuring from a tree, the trees being usually planted before the bushes. Even then, great care is needed to prevent a tree or bush from being put more to one side of the hole than the other, and frequent sighting is necessary to insure straightness in the rows.

If it is desired to angle the trees, so as to allow a little more distance between them across the rows, a tree and a bush can be planted alternately where the ploughed lines cross. The difference between planting on the square and in angled form is shown below, + indicating a tree, and o a bush :—

TREES SQUARELY PLANTED.

+	o	+	o	+	o	+	o	+	o
o	o	o	o	o	o	o	o	o	o
+	o	+	o	+	o	+	o	+	o
o	o	o	o	o	o	o	o	o	o
+	o	+	o	+	o	+	o	+	o
o	o	o	o	o	o	o	o	o	o

TREES ANGLED.

+	o	o	o	+	o	o	o	+	o
o	o	+	o	o	o	+	o	o	o
+	o	o	o	+	o	o	o	+	o
o	o	+	o	o	o	+	o	o	o
+	o	o	o	+	o	o	o	+	o
o	o	+	o	o	o	+	o	o	o

When the land has been subsoiled only shallow holes are necessary but they should be at least 4 ft. across each way for a tree and 3 ft. for a bush, in order that the roots may be

spread out to their full length. Nothing is more fatal to success than the mere digging of small holes and the sticking of the trees and bushes in so that their roots will be doubled up or cramped in space. Unless the land is in high condition or has been manured before it was ploughed, it is desirable, before the holes are dug, to cart some farmyard manure on to the field, placing small heaps at short intervals of space, so as to be within easy reach from each hole when planting is carried out.

If standards or half-standards are to be planted, strong stakes will be required, not less than 7 ft. long for the former or 6 ft. for the latter. They should be driven in so as to be about 18 in. below the surface of the soil before planting is done. If placed exactly in the centre of each hole the stakes will be in straight lines, and the trees tied to them must be so also. It is much easier to drive in the stakes before planting than afterwards, besides which possible injury to the roots of the trees is avoided.

A good distance for cherries is 30 ft. each way, bush plums or apples being planted between them, to stand until the cherry trees shade all the ground. Raspberries, usually grown by themselves, but occasionally as bottom fruit, may be set in rows 5 ft. apart, with 2 ft. in the rows. For strawberries, 3 ft. by 1 ft. 3 in. will do well.

The choice of varieties is too wide a subject to be dealt with here. Some varieties are suitable to certain districts and soils and not to others, so that the novice should always seek local information. A local grower of experience would be able to give good advice as to the varieties which flourish best in his district, and as to the best market sorts. Again, some varieties of apples are best as standards or half-standards on the crab stock, and others as bushes on the paradise. Upon these and other points sound information is to be obtained of any experienced nurseryman, or may be found in such excellent but expensive guides as Wright's "Fruit Manual" (Virtue & Co.), or the new edition of Thompson's "Gardener's Assistant" (Gresham Publishing Co.), or in the cheap but excellent manual by Mr. J. Cheal, entitled "Fruit Culture" (Bell & Sons). While it is desirable for market growers to plant only a limited number of the best bearing and selling varieties, so as to have a good

supply of each, it is well in starting to plant also a few trial rows of various other sorts, one row of each, to see how they succeed, with a view to planting extensively in future those which prove the best for the district.

The following is a list of culinary apples of good quality which fruit freely, and afford a succession from August until April, if the grower should be disposed to keep the last one named :—Early Julyan, Domino, Lord Grosvenor, Warner's King, Lord Derby, Bramley's Seedling, Lane's Prince Albert, and Newton Wonder. There are many other varieties as good as any of these, which are named because they are all desirable, and because they are in season one after the other as long as any apples can be kept. The following dessert apples would afford a supply from August to the end of the year, or possibly longer :—Mr. Gladstone, Beauty of Bath, Worcester Pearmain, King of the Pippins, and Cox's Orange Pippin. For later use, Mannington's Pearmain, Claygate Pearmain, and Duke of Devonshire, though not grown very extensively for market, may be planted on a limited scale, as they are of excellent quality and flavour, and will all keep up to March, the last being credited with keeping until April.

Plums of excellent repute for a succession are Rivers's Early Prolific, Czar, Victoria, Pond's Seedling, and Monarch. Pears are not very extensively grown for market in this country, and those which are grown are chiefly early and not very choice varieties, as few of the best are sure bearers, and pears from California compete severely with our best fruit late in the autumn and during the winter. Clapp's Favourite is one of the best early pears, and Williams's Bon Chrétien is a favourite market variety. Hessel is most largely grown in orchards near London and in Kent. Fertility, like Hessel, is a great bearer, and superior to it in quality, but a little later. Louise Bonne of Jersey is one of the most delicious of early pears, and a good bearer, but not a strong grower unless on very rich or heavily-manured land. Marie Louise d'Uccle, Emile D'Heyst, and Pitmaston Duchess are grown for market to a limited extent.

Damsons are planted at the present time mainly as shelter trees. King of the Damsons is perhaps the best variety ; but the Worcestershire Prune is most commonly grown in the

Evesham district, and the Crittenden or cluster damson in Kent.

Among the most important cherries for a succession are Governor Wood, Knight's Early Black, Frogmore, Blackheart, Black Eagle, Waterloo, Amberheart Bigarreau, Napoleon Bigarreau, and Turk.

Among gooseberries, Whinham's Industry can hardly be beaten for fruiting, and Keepsake, Lancashire Lad, Crown Bob, and Whitesmith are other excellent and prolific varieties. The mite has played such havoc in plantations of black currants in recent years that bushes should be obtained only from mite-free nurseries. Baldwin is one of the best varieties, but specially liable to mite infestation. Boskoop Giant is comparatively new to this country. It has been declared mite-proof, but this is probably an exaggeration. Lee's Prolific is an old favourite, but its berries are not as large as those of Baldwin, and not nearly equal in size to the Boskoop currants. Fay's Early, Early and Late Dutch, and Scotch Red are well known as good red currants, while Comet is a novelty yet to be fully tried.

Superlative is probably the best of all market strawberries, and a strong grower, while Hornet is another good variety, superior in flavour but not equal in size or so free a grower. Among strawberries, Royal Sovereign is now the chief favourite for market production, having superseded Paxton to a great extent, though the latter is still largely grown, as also is Stirling Castle. A new early variety is the Laxton, while Laxton's Latest is a novelty in late strawberries.

In some fruit plantations, strawberries are planted between the rows of trees and bushes, to stand until they are too much shaded, or until their profitable life is ended. This plan prevents horse cultivation, and it is preferable to grow strawberries by themselves.

An important point to be considered in relation to the planting of either raspberries or strawberries is whether sufficient hands can be obtained for picking promptly as the fruit ripens.

Returning to the subject of planting fruit trees and bushes, it is first to be observed that the work should not be done when the soil is in a wet condition, as it is of great importance to place friable moulds over the roots. If the weather is not

favourable when the trees arrive, they can be "laid in by the heels" until it is so. Then the first operation is the trimming of the roots, all parts bruised in the process of raising the trees in the nursery being cut off with a sharp knife. The cut should be made upwards from the base of the roots, so that the cut surface will rest on the soil.

In planting, one man should hold and place a tree, spreading out all the roots so that their ends slope slightly downwards, while another spreads finely-divided soil over them. The earth in the hole should be a little higher in the middle than towards the sides, to allow of the roots being spread well without being turned upwards. After some of the soil has been thrown in, a forkful of manure may be placed upon it, and the hole may then be filled up, being slightly rammed with a thick stake in the process, and trodden firmly at the finish. The trees should be so planted that they will be of the same depth in the soil after it has sunk as they were when growing in their nursery. On heavy land it is important to guard against too deep planting. Planting almost on the surface of heavy land, with small mounds of earth over the roots, is sometimes recommended; but this is questionable practice, as the earth is almost certain to be drawn away from the trees in hoeing, if not also to be washed away by heavy rain, leaving the roots insufficiently covered for a droughty season.

Trees and bushes should be cut back after planting when the weather is not frosty; but this operation comes under the head of "Training and Pruning," which will be treated separately.

In exposed situations it is of great importance to provide shelter against the prevailing winds, and where planting is to be done by instalments, extending over some years, it is advisable to put in shelter trees beforehand—the sooner the better. The Canadian poplar is one of the quickest-growing of trees, and for this reason it is extensively used for shelter. Its chief defect is that it is deciduous. On the other hand, evergreens are of much slower growth. The Austrian pine is frequently recommended, and it is an excellent shelter tree; but its growth is slow. A much more speedy grower is *Cupressus Macrocarpa*, which is one of the best shelter trees in other respects also for the southern half of England. In the bleaker north it is liable to be killed

by frost, and there the *Cupressus Lawsoniana* may be recommended instead. A single row of trees is not a sufficient windbreak where gales are violent, and it is a good plan to plant a triple row: damsons inside, *Cupressus* trees in the middle, and Canadian poplars outside.

Besides tall trees as windbreaks, the lower shelter of a dense fence is desirable. On most farms these are already provided, and regular brushing will thicken those which are gappy or thin at the bottom. For making a new fence quickly, or for filling up gaps, the Myrobalan plum is one of the quickest of growers, and a shrub which may be made to grow densely by early pruning and subsequent brushing. It is also good for the roadside to keep out trespassers, though not equal in that respect to the slower-growing whitethorn. One of the best of evergreen fences may be formed with the Euonymus, where it is not liable to destruction by frost, as it is in the bleakest parts of the country. Many other trees and shrubs are suitable for sheltering purposes, and it is advisable to select those which are known to flourish where fruit planting is to be carried on.

With respect to the extent of planting at any one time, it is desirable to point out that the capital required for extensive operations is considerable. It is not only the expense of preparing and manuring the land and the purchase and planting of trees and bushes that have to be estimated. At least as much should be allowed for the annual loss on a plantation before it comes into profit. From five to six years from the time of planting will usually elapse before the plantation comes into profit, and in the meantime the expenses of cultivation, spraying, pruning, manuring, picking, and marketing, with rent or interest on capital, tithe (if the land is owned by the planter), rates, and taxes, will greatly exceed the returns. Thus every acre planted is taken out of the area of a farm which, under ordinary cropping, might yield an annual profit. No fixed estimate of the amount of capital that will be sunk can be given, as it will vary with the condition of the land, the stamina of the trees and bushes when planted, and the care and good judgment exercised in their treatment. The amount, of course, is much less where a tenant plants, his landlord providing the trees and bushes, than where the planter owns the land; or,

again, it will be less where a small holder does all the work than where all labour is hired.

It is desirable to warn inexperienced planters against the purchase of very cheap trees and bushes, unless they are found, on inspection, to be well up to the mark. On the other hand it is not desirable to pay extra prices for oldish trees or bushes, as those which are two to three years old commonly do best. But weak or stunted trees or bushes are dear at any price.

WILLIAM E. BEAR.

RAISING AND FATTENING GEESE FOR MARKET.

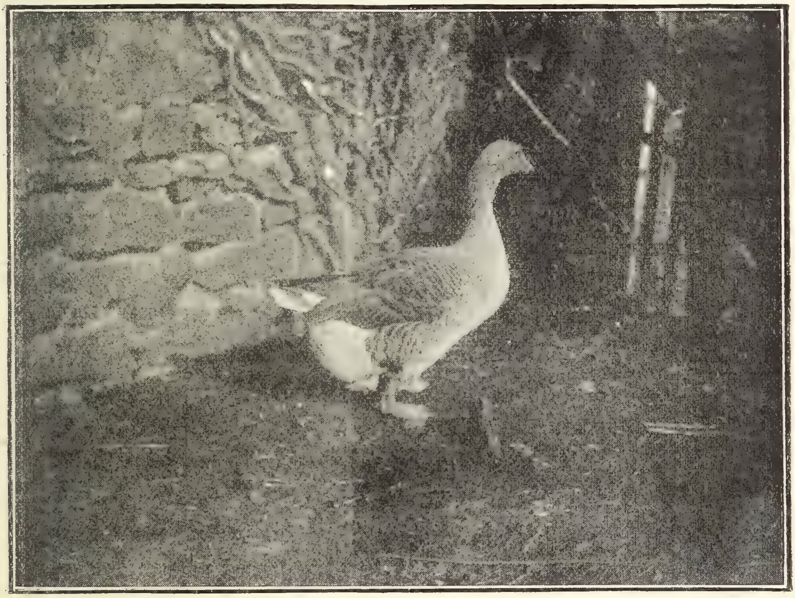
Goose raising, if intelligently and systematically carried out in those districts which are adapted to it, might in a short time become an important rural industry. At certain seasons—especially Christmas and Michaelmas—there exists a very good demand for large, well-fattened geese in almost every market in Great Britain and Ireland, and the prices obtained are remunerative and should leave a substantial profit after all expenses have been paid. Moreover, for really well-fattened birds the demand is always greater than the supply.

There are in these islands some very fine breeds of geese, among which may be mentioned the Embden, the Toulouse, and the Chinese, though even in the breeding of these there is still some room for improvement.

The Chinese goose is a rather small, hardy, and very prolific bird. It matures early, and its flesh is tender and delicate. It can, therefore, be recommended as a useful breed for those who wish to produce geese for the Michaelmas markets. It is also a good breed for crossing with either the Embden or the Toulouse when early goslings are desired. On the other hand, the Toulouse and Embden are undoubtedly the best breeds for the production of large-framed, weighty birds, such as are in demand at Christmas. As a table bird there is little choice between these two fine breeds. The Embden is more highly prized by some for the value of its feathers, which are pure white, but the

Toulouse is also greatly esteemed for its prolificacy and other qualities.

Geese of the larger breeds are of little or no use for breeding until they are two years old, but, unlike fowls and ducks, they are prolific up to a great age. The females may be kept for breeding purposes up to twenty years, but it is not advisable to keep males beyond the age of six or seven years. Of the larger breeds, each breeding pen may consist of one gander and only



A TOULOUSE GOOSE.

two geese; but of Chinese, three or four geese may be kept with one male bird.

If geese have been well fed through the winter they usually commence to lay between the middle of January and the middle of February, and continue laying one egg in every two days until the end of March or middle of April, at which time they become broody. Therefore it is necessary to provide some means of incubating the eggs which are laid during the first few weeks. In some instances incubators have been successfully used for this purpose, but large hens, such as Brahmas or Cochins, can hatch four or five goose eggs, and serve very well for the purpose. They also make careful foster-mothers.

The eggs which are laid during the last two or three weeks can be reserved for setting under the geese themselves. A large goose can hatch thirteen to fifteen eggs, but the largest geese do not make the best sitters or the most capable mothers, and if they are to be entrusted with valuable eggs large nests must be provided, which must be constructed with special care. The space for the nest ought to be three feet square, and enclosed by boards only five or six inches high. A large quantity of straw must be used in making the nest, in order to give it that elasticity which is necessary to prevent the goose breaking the eggs when she enters the nest or leaves it. The nest should be made nearly flat, having only a slight depression towards the centre. While hatching, the goose should be taken off the nest once a day and fed with oats and water. Charcoal and grit should also be placed within reach.

The period of incubation is from twenty-eight to thirty days, and for twenty-four hours after the goslings have left the shells they may be left on the nest. It is then time to give them the first meal. This may consist of oatmeal, middlings, finely-chopped dandelion, lettuce or similar greenstuff, and milk. During the first week it is well to keep the goslings indoors, and to feed them four or five times a day on the mixture named. After this time they may be put into a paddock, and if the grass is rich and not overgrown they will thrive on it with very little hand-feeding. Two feeds a day will be quite sufficient between the ages of one week and six weeks, and during this time no better food than ground oats and skim milk can be used. It is, of course, quite unnecessary to feed any chopped green stuff after the young birds have been turned on to grass. During the period which elapses from the time of hatching until the goslings are nearly feathered, they must be housed at night, and also in the daytime should the weather be wet or stormy. During their early days goslings cannot be allowed free range over large fields or marshes, because the old geese would be liable to give them too much exercise. They may, however, be given full liberty to range at large after they have attained the age of eight weeks. It is then only necessary to feed them once a day, and the best time to give this meal is in the evening, when they return from the fields to the farm-

yard. If the geese are kept on rich pastures, it will not be necessary to give them even one meal a day, since they thrive very well on rich grass, and for this reason it is most economical to raise them on the best class of grazing land. Geese may, however, be profitably raised even on poor land, swamps and marshes, but when kept in such places it is nearly always necessary to supplement their pickings by hand-feeding. A good deal depends upon the breed of geese kept, as the Chinese or other hardy breed might do well upon land that would not support the Embden or Toulouse. It is generally advisable to raise one or two flocks of geese on a tillage farm, for although the grass may be poor, there is usually an abundance of roots, potatoes, and corn upon which the birds can be fed.

There is no branch of poultry culture more profitable than the raising and fattening of geese for market, when properly carried out, but goose rearing, probably, hardly pays when carried out in a haphazard and unsystematic way. There is a substantial profit if the birds are treated rationally before killing, but if they are taken off the grass or stubbles and killed without any special fattening they are likely to be a source of loss rather than profit.

The same rule applies to the fattening of geese as to the fattening of any other stock—that is to say, they must be ready at the exact time when demand is likely to be greatest. It is not a difficult matter to arrange this if the dates when the best markets open and the length of time which it will take to fatten the birds are known. The seasons of greatest demand for geese are Michaelmas and Christmas, and a certain portion of our flocks should be ready for each of these settled markets. I may say that at Michaelmas tender, plump birds of medium size are most sought after, and it is a good plan to select any small-framed birds, which are not likely to make any great growth, and to fatten these for Michaelmas. It is probable that it will pay better to fatten such birds in September than to keep them on hand until Christmas.

Preparation for Christmas Markets.

Provided that the geese are of a large breed, there is little difficulty about getting them up to a good weight at Christmas.

The price is fixed in London, Liverpool, Manchester, Glasgow, and other important markets, according to size and weight as well as to quality, and the greater weight they can be brought to the greater is likely to be the profit. The truth of this statement is borne out by the following quotation of prices, which were received last year by several private exporters and co-operative societies in Ireland :—

Geese	weighing	under 10 lb.,	killed	and	plucked,	6d.	per lb.
,,	,,	10 to 12 lb.,	,,	,,	,,	7d.	,,
,,	,,	over 12 lb.,	,,	,,	,,	8d.	,,

From these figures it will be seen that it pays well to commence a thorough system of feeding towards the end of autumn, and to continue it without intermission up to the time of killing. The system most effective for increasing size up to a certain point and then putting on weight may be thus described. As soon as the corn has been gathered off the stubbles, which is some time between August 15th and September 15th, the geese are turned on to pick up any scattered grains which have escaped the harvester's rake. On the stubbles they may find sufficient food for four to eight weeks, but it depends on the size of the flock, the area of the fields, the quantity of loose corn which is lying about, how long this supply will last.

The point to be remembered is that as soon as the scattered corn is beginning to run out the geese must not be allowed to go out of condition, but must be kept growing by a feed of corn once a day. They may still be allowed to run on the stubbles, for they are likely to find much food there in the shape of weeds, seeds, and grasses, but a supplementary feed of oats or barley when they return to the farmyard at night is needful to keep them growing.

If the stubbles are far from the farmyard, it is a good plan to quarter the geese there altogether for a few weeks, and this can be done without any great expense if a temporary shed is erected which will afford protection against foxes at night, or two or three portable wooden fowl-houses may be utilised for the purpose. If there is neither a pond nor a stream in the field, it will be necessary to provide water in troughs or tubs.

When treated in this manner, geese will grow to a large size without becoming too fat. This is all that is necessary, as a

large frame is required upon which flesh can be put when the proper time comes. This may be about November 25th, since geese take about three weeks to become thoroughly fat, and the Christmas markets will be in full swing during the four or five days following December 18th.

The system of fattening practised by a goose farmer in the North of Ireland may be described here as an example of methods which have proved to be successful. When November 25th comes the geese are shut up in sheds for fattening, for though they have been well fed for several weeks past, they cannot be called "fat geese" until they have gone through a special course of fattening, and if they were sent to a poulterer's after any amount of stubble feeding, they would sell only as "grass geese," and at unsatisfactory prices. While confined for fattening, geese require plenty of fresh air but very little light, and these conditions are provided by housing them in large, airy sheds, well ventilated, but without windows. Two of these sheds, each 150 ft. long, are situated in a portion of the farm-yard where the fattening geese are not likely to be disturbed by the calling of the old geese or the cackling of other members of the feathered tribe, as it is necessary that geese while confined for fattening should be undisturbed.

Preparatory to the fattening season, the sheds are thoroughly cleaned and lime-washed, and the floors are covered over with a thick layer of cinders, ashes, and charcoal. This combination forms the best of all kinds of bedding, for it is a fine absorbent of moisture and a powerful deodorant. During the whole time of fattening it is, moreover, not necessary to clean out the bedding, but only to add a little fresh stuff every day. Thus much labour is saved, and the manure is kept in good condition till it can be removed to the pit. The floor is divided into spaces 15 ft. by 10 ft., and each of these holds fifty geese. The partitions are made of boards 2 ft. high.

Troughs for feeding are arranged along the walls inside the house, and troughs for watering outside in such a manner that the birds can reach the water through a barred partition, but cannot get into the water or splash it. Clean charcoal should be put into the house every day, as it is eaten by the geese, and serves as an appetiser and corrective. The value of charcoal in

the feeding of geese in confinement is very great, and it has been found that geese which have free access to charcoal eat less food but gain considerably more in weight than those without it.

The following table gives the results of some experiments which have been conducted to ascertain the increase in weight due to different kinds of food :—

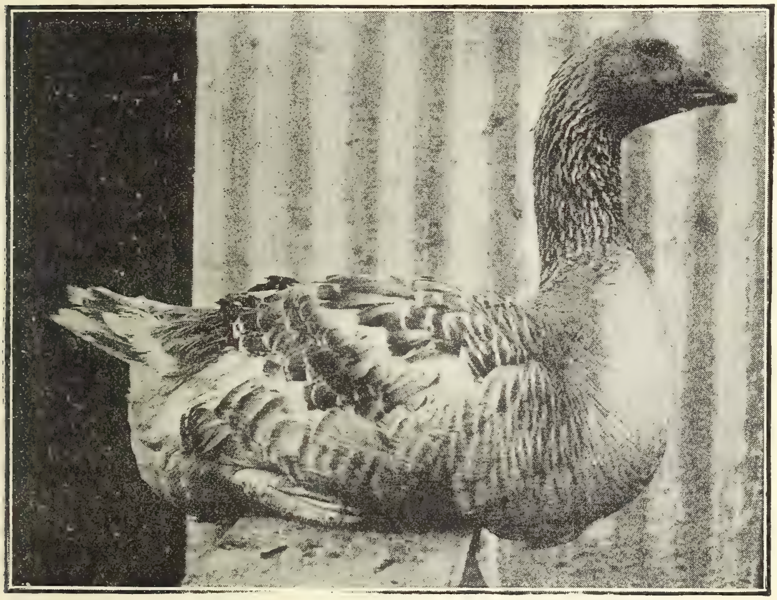
Lot.	No. of Birds.	Weight when put in.	Weight on 11th day.	Weight on 21st day.	Average Gain per Bird.	Average Cost of Food.	Foods Used.
		lb.	lb.	lb.	lb.	s. d.	
1	25	260	327	370	$4\frac{2}{5}$	1 3	Morning : Steeped oats. Evening : Two parts maize-meal, two parts barley-meal, two parts boiled potatoes, and one part linseed-meal mixed with milk.
2	25	264	$328\frac{1}{2}$	371	$4\frac{7}{25}$	1 3	
3	25	257	324	355	$3\frac{23}{25}$	1 0	Morning : Steeped oats. Evening : Two parts ground oats, two parts barley-meal, three parts boiled potatoes, and milk to moisten.
4	25	261	318	361	4	1 0	
5	25	260	322	352	$3\frac{17}{25}$	0 11	Morning : Steeped barley. Evening : Two parts distillery oil-cake, one part barley-meal, and one part ground oats, wet with milk.
6	25	255	320	350	$3\frac{4}{5}$	0 11	
7	25	259	$317\frac{1}{2}$	340	$3\frac{6}{25}$	0 10	Morning : Steeped barley. Evening : Three parts distillery-oil cake, one part barley-meal, one part bean-meal, and milk as above.
8	25	262	322	346	$3\frac{9}{25}$	0 10	

It will be seen from the above table that the average cost of feeding the birds in Lots 1 and 2 was greater than that of any other, and half as much again as the cost of feeding Lots 7 and 8. Yet if the birds are to be sold in those markets where geese are bought by weight, it would pay better to use the more expensive food given to Lots 1 and 2, because the heavier the goose the higher the price per pound, and by raising the weight from 11 to 13 lb. the selling price of the bird may be increased by 2s. 3d. That is to say, at an additional cost of six or eight pence, a goose which would only fetch 6s. 5d. may be converted into one which will realise 8s. 8d.

Whether required for market or for home consumption, it is advisable to fatten geese under the system above described, and to feed them on one of the suggested rations or some similar combination of food which has been proved to be equally economical. The process of fattening not only increases the size and weight, but also improves the flavour and texture of the flesh.

Killing and Plucking.

The feathers of the goose are valuable and always saleable,



TOULOUSE GOOSE (SPECIALLY FATTENED).

so that care should be taken before killing that the feathers are as clean as possible. If the water has been kept outside the fattening-house in the manner described and the bedding regularly renewed the feathers will not probably be in a bad state, but they may be improved by a good washing two or three days before the birds are to be killed. The best way is to let them have access to a pond or river for a day, and afterwards to enclose them as usual, but on a good bed of dry straw instead of ashes or cinders. The feathers must have time to become dry before the birds are killed, otherwise there will be

considerable difficulty about saving them, and it can never be done in quite a satisfactory manner.

The immediate preparation for killing consists, as with all kinds of poultry, in fasting the geese for about twenty-four hours previously. If practicable, all the geese which are confined in the same house or pen should be killed on the same day, because the birds are much attached to one another, and if some are killed those which remain will lose weight for several days.

There are several ways of killing geese, any one of which will suit if the operation is skilfully performed. One method is to grasp the legs and wings in one hand and the head in the other, and to kill by dislocation of the head from the neck. A fair amount of strength is required to kill in this way, and sometimes it is necessary to hang the birds by the legs on a wall-hook in order to get a fair pull at the neck. Another method which is much in vogue in certain districts is to hang up the bird in the manner described, strike it a sharp blow on the poll with a stick to stun it, and then bleed by severing the large arteries of the throat with a sharp knife. Whatever method is adopted the goose "dies hard," and it takes a strong hand to end its life.

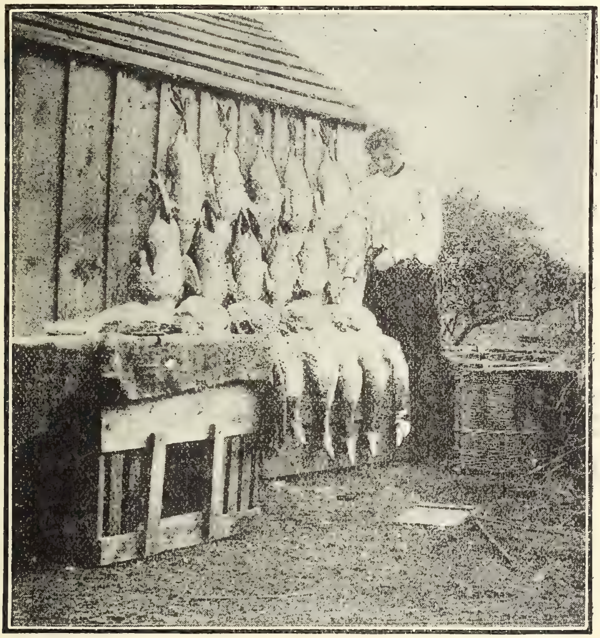
To pluck a goose is rather a tedious job, but those who are accustomed to it can "clean pluck" twenty to thirty geese in a day with no more than ordinary exertion.

The feathers should be taken off the entire body, with the exception of the tops of the wings, the head, and neck. If there are any pin feathers, they must be "stubbed" with a blunt knife, even though it takes some time and trouble, for before despatch to market it is essential that the bird should look as well as possible, in order that it may fetch a high price.

When plucked, the carcases should be placed on shelves or strung over a line to cool, and they must not be packed until quite cold. They may be despatched to market in hampers which are lent on hire by several of the railway companies, or in any clean, light hampers or crates. It is most satisfactory to sell to retail dealers, or even to wholesale men, at prearranged net prices, whenever this can be managed, because if geese or any other kind of poultry are consigned "on commission," the

"market charges," "commission," and other deductions are apt to make a hole in the sum which one counts on receiving for one's birds.

As already stated, goose feathers are very valuable and always saleable, but care must be taken in curing them. Very few people have the requisite knowledge or facilities for curing them properly, and perhaps the wisest course is to spread them in a loft for a week to dry, and then despatch them in canvas bags to the feather-monger's.



DRESSED GEESE READY TO BE PACKED FOR DESPATCH TO MARKET.

In conclusion, it may be said that the loss in killing geese in a lean or semi-lean condition is sure to be considerable, whilst a small expenditure of labour and money would convert a coarse, rank, skin-and-bone goose of 10 lb. weight into a 14-pounder whose flesh is as tender, succulent, and juicy as that of a duckling.

H. DE COURCY.

AFFORESTATION OF CATCHMENT AREAS BY LOCAL AUTHORITIES.

The Departmental Committee appointed by the Board of Agriculture to enquire into and report upon British Forestry, 1902, had before them evidence as to the work undertaken by the Corporation of Liverpool to afforest the catchment area, around Lake Vyrnwy, from which the water supply of that city is derived, and they thought that this was a direction in which a considerable amount of afforestation might usefully be done. To minimise the risk of contamination of the water supply it is at the present day the policy to remove, as far as possible, all human habitations and farm buildings, as well as live stock, from such areas. These areas, therefore, however well suited they may otherwise be for the production of crops or the maintenance of live stock, are practically derelict, and yield no return, beyond that obtained from the sale of the water, upon what is usually a very heavy capital expenditure on the part of the Corporation. The Committee recommended, therefore, that the attention of Corporations and Municipalities should be drawn to the advantages and profits to be derived from planting their catchment areas with trees. They pointed out that such planting would, ultimately, not only contribute materially to the retention of the water that fell as rain over the area, and thus assist in regulating the water supply and in preventing floods and water famines, but would tend to the purification of the water, and should also, properly managed, yield a fair and regular income on the capital expended. Such catchment areas, if they are to be thus utilised, should be placed under the control of a competent forester; and inasmuch as they will be under corporate control, and less subject to changes of management than land owned by private individuals, there is no reason why they should not also ultimately serve as demonstration forests and be available for the instruction of students. For example, the catchment areas of the Liverpool and Birmingham Corporation Waterworks, situated in Wales, within reach of University Colleges possessing agricultural departments, could, with the consent of the Corpora-

tions concerned, be used for these purposes, and similarly with regard to certain areas in Yorkshire within reach of the University of Leeds.

With the assistance of the English and Scotch Local Government Boards, the recommendations of the Committee have now been brought under the notice of all the local authorities in England and Scotland, and the Board at the same time took the opportunity of ascertaining which authorities have acquired the freehold or long leasehold of the catchment areas from which their water supplies are derived, and a statement of the acreage and altitude of the respective areas. The following tables give particulars of these cases, excluding those in which the freehold

County in which Area is situated.	Local Authority.	Area of Freehold or Long Leasehold Land.	Range of Altitude.	Description of Area.			
				Hill Pasture.	Arable.	Peat.	Woodland.
		Acres.	Feet.	Acres.	Acres.	Acres.	Acres.
Cumberland	Keswick	500	615–2,800	500	—	—	—
Derby and Yorks	Derwent Valley	577	776-1,000	463	—	—	114
Derby	Matlock	289	800	129	30	120	10
Devon	Paignton	700	900–1,700	700	—	—	—
,,	Plymouth	348	—	—	—	—	95
,,	Torquay	2,241	700–1,100	1,574	212	—	105
Lancashire	Bolton	4,455	700–1,350	2,177	—	2,278	97
,,	Bury	4,594*	475–1,300	3,984	—	610	—
,,	Darwen	500	700–1,300	nearly all	—	some	12
,,	Heywood	500	700–1,500	do.	—	do.	—
Montgomery	Liverpool	22,325*	825–2,185	do.	some	2,160	606
Cumberland	Manchester	11,000	533–3,117	do.	—	—	—
Lancs. & Yks.	Oldham	2,659	778–1,450	1,923	442	1,982	36
Sussex	Brighton	1,100	140–580	649	451	—	—
Denbigh	Oswestry	241	1,100–1,420	174	13	30	—
Radnor	Birmingham	4,925	700-2,115	nearly all	—	—	410
Warwick	Stratford-on-Avon	722	300-400	601	55	—	66
Worcester	Malvern	117	570	117	—	—	—
Yorkshire	Bradford	7,000	446–2,300	all	—	—	—
,,	Dewsbury	2,488	1,050–1,480	do.	—	—	—
,,	Huddersfield	340	630–1,642	—	—	—	—
,,	Halifax	1,311	850–1,450	550	—	711	50
,,	Ilkley	200	—	200	—	—	—
,,	Keighley	1,142	825–1,425	1,142	—	—	—
,,	Leeds	11,778	350–1,550	11,074	very little	—	239

* Part of this remains to be purchased.

area is small. Lands held subject to common rights are also excluded. The information supplied by the local authorities does not enable the description of the area to be fully shown in all cases.

In connection with the above particulars, the following notes may be of interest :—

Keswick.—The Council intend to plant portions of their land.

Plymouth.—The Corporation some years ago planted so much of the watershed as then belonged to them.

Torquay.—The Council have for some years planted trees, and are still planting them, on the catchment area.

Darwen.—It will shortly be proposed that a moderate sum should be spent annually in planting.

Manchester.—Small areas of land have been planted at different times by the Corporation, but there is very little depth of soil.

Oldham.—Experimental afforestation was commenced in 1887, but has had only a very moderate degree of success. The high elevation of the areas and consequent severity of the winters, combined with the smoke from neighbouring towns, have to a great extent prevented growth, and trees, after being planted seventeen years, do not exceed ten feet in height, and are stunted in character.

Birmingham.—The Corporation have had the area reported on, with a view to the apportionment of suitable areas for tree-planting, and about 1,000 acres have been allocated for plantations. The trees to be planted are principally larch, with Scotch fir and spruce. The Corporation have been advised to confine themselves entirely to coniferous trees, as deciduous trees would be likely to interfere in the autumn with the purity of the water. This objection does not appear to be well founded, for although evergreen trees, as are most conifers, do not annually denude themselves of all their leaves, they nevertheless shed each year a proportion of their foliage, and there is probably no great difference in the aggregate amount of foliage parted with annually by the two classes of trees. The leaves of most deciduous trees would, however, be blown in larger quantity into the reservoir and its feeders, though this could be largely prevented by proper management. In any case, the altitudes of

most of the land of catchment areas would seriously limit the cultivation of deciduous trees, with the exception of the larch.

In the case of Liverpool, Mr. Joseph Parry, Chief Engineer to the Liverpool Corporation Waterworks, gave some particulars to the Committee as to the steps taken towards planting the catchment area round Lake Vyrnwy. The direct drainage area is 18,500 acres, of which 1,000 acres have an altitude of from 825–1,000 ft.; 2,000 acres between 1,000 ft. and 1,250 ft.; 3,600 acres between 1,250 ft. and 1,500 ft.; and 8,000 acres between 1,500 ft. and 1,750 ft., the rest of the drainage area being at a still higher elevation. The trees planted include larch, Scots pine, Douglas fir, Spruce fir, Corsican pine, Weymouth pine, beech, sycamore, ash and alder, the plantations being supplied from the nurseries established on the estate by the Corporation. The total expenditure on the plantations has been at the rate of about £200 per annum, while in the five years up to 1902 a total of about £300 had been spent on the nurseries.

Similar particulars relating to the catchment areas of water undertakings belonging to local authorities in Wales are given below:—

County in which Area is situated.	Local Authority.	Area of Freehold or Long Leasehold Land.	Range of Altitude.	Description of Area.			
				Hill Pasture.	Arable.	Peat.	Woodland.
		Acres.	Feet.	Acres.	Acres.	Acres.	Acres.
Carnarvon	Conway	328	300–600	328	—	—	—
,,	Conway and Colwyn Bay	1,067	1,169–2,621	1,067	—	—	—
,,	Llandudno	1,481	1,520–3,195	494	—	987	—
,,	Penmaenmawr	832	1,000–2,000	832	—	—	—
Glamorgan	Briton Ferry	625	200–900	600	—	—	25
Brecon	Cardiff	1,000	800–2,000	1,000	—	—	—
Glamorgan	Glyncorwg	550	900–1,500	540	—	10	—
Merioneth	Towyn	217	200–300	100	—	—	—
Montgomery	Machynlleth	271	288	204	—	—	67

The Llandudno Urban District Council state that they have considered the question, and have decided not to plant trees on account of the bleakness and inaccessibility of the position, and because most of the area above the lake levels is considered unsuitable for the purpose.

In the case of Cardiff it is not at present proposed to buy up the catchment area proper, but some little of the area of 1,000 acres owned by the borough has been planted, and it has been suggested, though nothing has yet been done, that a large proportion of it should be planted.

The municipalities in Scotland which have acquired the freehold or long leasehold of the catchment areas from which their water supplies are derived are not numerous, but where they have acquired an area of over 100 acres the particulars are included in the following table :—

County in which Area is situated.	Local Authority.	Area of Freehold or Long Leasehold Land.	Range of Altitude.	Description of Area.			
				Hill Pasture.	Arable.	Peat.	Woodland.
		Acres.	Feet.	Acres.	Acres.	Acres.	Acres.
Aberdeen	Turrift	318	243–540	—	305	—	13
Argyll	Dunoon	1,400	200–1,600	1,400	—	—	—
Banff	Aberchirder	110	720	29	81	—	—
Berwick	Lauder	650	900	650	—	—	—
Dumbarton	Helensburgh	850	500–2,160	850	—	—	—
Fife	Cupar	820	528–800	120	670	—	30
Perth	Dunfermline	1,300	900–2,000	1,300	—	—	—
Inverness	Kingussie	300	1,500	300	—	—	—
Kirkcudbright	Kirkcudbright	150	150–350	—	150	—	—
Lanark	Middle Ward	404	850–1,075	404	—	—	—
Linlithgow	Whitburn	100	600	20	80	—	—
Peebles	Edinburgh	5,678	950–2,625	4,836	—	440	—
Ross and Cromarty	Tain	210	1,000	139	—	47	24

In the case of the Burgh of Dunfermline, it is observed that "the drainage area is much too exposed for tree growing."

The Corporation of Glasgow does not own any of the land in the catchment areas, except the sites of reservoirs and accessories to the waterworks. The right to take water from the lochs and streams was acquired by various Acts of Parliament from 1846 to 1885. The feuing rights over the whole drainage area to Loch Katrine were purchased by the Corporation and confirmed by an Act in 1892. The catchment area of the Loch Katrine Waterworks amounts to 23,192 acres and of the Gorbals Waterworks to 2,750 acres.

CO-OPERATIVE GRANARIES IN GERMANY.

The establishment of co-operative warehouses for the storage and sale of grain in Germany has been referred to in previous numbers of this *Journal*,* and although the development of co-operation on these lines has not been very rapid, it appears to be making steady progress, and warehouses for this purpose now exist in the principal German States.

The question of constructing these granaries, it may be remembered, first became prominent in 1895. In 1896 the Prussian Government granted a subsidy of £150,000 to be devoted to this purpose, and in 1897 a second sum of £100,000 was placed at the disposal of the Government. The idea seems to have been to endeavour to obtain for the growers, particularly the peasants and smaller proprietors, a more direct trade with the consumers. It was represented that owing to the lack of such granaries the growers were often compelled to sell their corn immediately after harvest at unfavourable rates instead of being able to wait for better prices. On the other hand, it was urged that such associations had not proved successful in speculative transactions; and that if they confined their operations merely to the storage of each member's grain it was doubtful whether the profit would balance the cost of erecting the storehouses.

In 1903 there were in Prussia 36 warehouses erected with the aid of the funds mentioned above, and of these particulars were available in regard to 32. The number of members belonging to these 32 societies was 8,915, and the capacity for storage 47,600 tons. The quantity of grain of all kinds dealt with during the season was 2,195,000 cwt., or about 68,800 cwt. each.

The sale of the grain is not always on a co-operative basis, as some of the granaries buy and sell grain on their own account. This brings into their operations a certain element of speculation, and in times of fluctuating prices may lead to financial difficulties. It seems, however, that this system is largely adopted. The grain is also sold on commission, subject to a charge for warehousing. A third method is that of co-operative

* Vol. III., p. 53; Vol. IV., p. 374; Vol. VII., p. 509; Vol. VIII., p. 88

sale. By this system the members undertake to deliver their whole crop as it is threshed, and they receive on account about 75 per cent. of the current price. The society sells the grain to the best advantage according to its judgment. At the end of the season the average price obtained for each quality, of which there are generally three, is ascertained, and the members then receive the difference between this price and what they have already received after a deduction for cost of warehousing and for the expenses of the society. The members thus participate equally in the returns and obtain the average price for the year.

An essential part of the business is the facility afforded for drying and cleaning the corn, as all the warehouses are provided with machinery for this purpose. Generally the results obtained by the cleaning of the grain have been favourable, but in some cases it is stated that the cost of cleaning wet grain is not covered by the improved value.

On the whole, according to an official Report* recently published, there was a nearly unanimous opinion on the part of the managers of these corn-houses that in the districts provided with them the small proprietor who takes his grain to market in small quantities obtains a larger share of his produce than formerly, and that the difference in price previously existing between the larger markets and smaller places and railway stations has sensibly diminished. Out of the 32 warehouses, 16 made a profit on the year's working and 13 a loss, while in the case of three their receipts and expenditure balanced one another. The reserve funds increased during the year from £12,000 to £17,000. The lack of success from a financial point of view, where it occurred, is attributed to a variety of reasons, among which may be mentioned the fact that in some warehouses there is no obligation on the members to deliver the whole of the grain grown by them. It is noted that better financial results seemed to be obtained in those cases where the assistance afforded by the State was the least, and the responsibility of the society correspondingly greater.

The societies by whom these granaries are managed are all affiliated to some central union, and their work is centralised

* *Deutscher Reichs-Anzeiger*, June 24th, 1904.

in the permanent German Corn-house Commission. Conferences are also held, at which subjects connected with their construction, mechanical installation, and management are discussed.

The question of how far these associations have justified expectations seems, however, to be a matter of opinion. In a recent Foreign Office Report*, dated June 13th, 1904, Mr. Consul-General Oppenheimer observed that "the corn-houses were intended to afford the farmers the opportunity of storing their grain in a rational way against advances in cash until the time for profitable sales might have come. Several of these unions publish very unfavourable balance-sheets: the Pomeranian Union closes its accounts with a loss of more than £10,000, with a reserve fund amounting to only £10,750; the Pyritz Agricultural Union closes with a loss of £2,750, with very considerable outstanding liabilities, and several others are in an equally precarious condition. The prohibition of time bargains in grain and mill products undoubtedly indirectly contributed to these disappointing results, for the unions were deprived of any possibility of protecting their stores against losses by sales for future delivery."

At the same time, however, as was pointed out above, they have succeeded, in the opinion of their promoters, in enabling agriculturists to sell their grain under better conditions than when they had to deal with merchants alone, and at the third German Corn-House meeting a resolution was passed pledging the meeting to replace the corn exchanges in Germany by an effective organisation and practical system of corn-houses. Mr. Oppenheimer observes, however, in regard to this resolution, that "past experience hardly justifies any great hopes in that direction."

Included in the 36 granaries referred to above, is the experimental elevator or grain warehouse at Berlin, which receives a grant of £500 per annum. The objects of this experimental station are to undertake: (1) experiments with silos and open floors, with a view to ascertaining the cost of warehousing and dealing with the grain; (2) experiments with new apparatus for transport, loading and unloading, movement in the ware-

* Annual Series, No. 3,221.

house, cleaning, separating, storing, drying, &c.; (3) investigation of the changes produced in grain by storage, of the conditions producing heating in bulk, of the effect of the handling on the use of grain for fodder, for malt, &c.; (4) the working out of methods for judging and valuing grain rapidly, and for ascertaining the water-content; and (5) experiments for the eradication of insect and fungoid pests.

In order to provide material for observations on these lines and also to enable the warehouse to be self-supporting, the ordinary business of storing, cleaning, drying, &c., is carried on as a commercial undertaking. The total capacity of the warehouse is 1,100 tons.

There are also in Prussia nine societies which have been founded independently and have not participated in the State grants. Among these may be mentioned the corn-house of Dortmund, which obtained a loan of £6,000 from the town authorities. The capacity of this granary is some 50,000 cwt., and the quantity of grain dealt with annually about four times as much. It has affiliated to it twenty-four local societies.

In Bavaria co-operation in all branches of agriculture has, owing to the great number of small proprietors, been more fully developed than in other parts of Germany, and the corn-house movement seems to have been more successful and to be more widely spread than in Prussia.

There were, according to a Report published by the Bavarian Ministry of Agriculture, no less than 97 warehouses in existence up to the end of November, 1903, and nine additional ones were under construction, compared with only 19 in 1897. These warehouses, however, vary much in size. Some are provided with machines for cleaning, distributing, &c., driven by electricity or oil motors, while the smaller ones comprise only a hired shed or room with a cleaner, winnower, and weighing machine. The total cost of building, &c., was £94,525, towards which the Government had assisted by grants to the extent of £7,850, and by loans to the extent of £37,468. The quantity of grain dealt with amounted to nearly 900,000 cwt. in 1902-3. Seventy of the granaries were on the railway, mostly with sidings or approaches, and, with the exception of eight, the advantages of the granaries were open to non-members. This

is not always the case in Prussia, and the lack of success obtained by some of the granaries in that country was attributed to the limitation of the business to members only. The warehouses may purchase grain at a fixed price and sell it at their own risk, or they may act merely as agents for the sale. The charge for cleaning, based on the weight of dressed corn, or sometimes on the time occupied, varies from rather over ½d. to 3½d. per cwt. With regard to the financial result, 57 of them were reported as showing a profit and eight a loss, while a number were stated to be worked without either profit or loss.

The sales through the warehouses are stated to have resulted nearly everywhere in higher prices being obtained than in the open market. The difference in 1901-2 amounted to as much as 1s. per cwt., and in 1902-3 very frequently to 6d. per cwt. In the latter year, out of 70 warehouses, 61 reported that they obtained higher prices through co-operative sale, while in the case of the remaining nine the prices were about the same. Moreover, in consequence of the competition, the dealers were compelled to adjust their prices, so that the agriculturists of the district all participated in the benefit. The cleaning of the grain in the warehouses contributed materially to the favourable results obtained. At the same time, there are complaints of a lack of a proper sense of co-operation, which leads some farmers to send to the warehouses only inferior grain which they are unable to dispose of elsewhere.

Government assistance in the construction of granaries is only afforded when it is considered that they are likely to meet an actual need, and the supporters of the enterprise have to provide a guarantee, and submit plans, &c., to the Granary Commission of the Bavarian Council of Agriculture.

The construction of these co-operative granaries close to the railways has been encouraged by the Government by the free grant of building land and by affording facilities for the construction of railway sidings. By a decree of July 23rd, 1898, where alterations become necessary at railway stations to meet the requirements of co-operative granaries, the expenses of such alterations are to be borne by the State railways up to a limit of £500 at each place. The co-operative society by whom the granary is built have to construct the necessary roads or means

of access to the railway line, if any, exclusively employed by them, but not to bear the cost of the necessary superstructure. From 1898 to 1903, out of 50 granaries belonging to co-operative agricultural societies, 41 are situated on railway land which has been granted free of rent.

Purchases from these granaries are largely made by the State Departments, as well as by large breweries, millers, &c.

The co-operative sale of grain has also been attempted in Wurtemburg, and in 1900-1901 there were 24 local societies for this purpose, most of which have received small grants from the State. Three of them have built grain warehouses, but most if not all of the remaining societies have limited themselves to procuring corn-cleaning machines, supplying sacks, &c., and have made use of any available accommodation in the neighbourhood as a centre for the collection and cleaning of the grain. The following description of a warehouse recently erected at Ohringen by one of the societies may be of interest as indicating the character of the larger corn-warehouses both in Wurtemberg and elsewhere.

The building at Ohringen has three stories about 51 ft. by 46 ft., and a height of over 65 ft. The motive power employed is electricity, and there are four motors—one of 10, one of 3, and two of 2 horse-power each. These also provide the electric light.

On arrival at the warehouse the grain is shot into the hopper of the elevator, which is worked by one of the motors. Thence it is carried to the top of the elevator in the roof of the building, where it passes over a magnet which collects and retains any small scraps of iron which it may contain. The grain is then conveyed to the hummeller, where the awns or heads of the grain are rubbed off and taken away; thence it falls on to a sieve or "shaker," which separates all weeds, sand, &c. On the next sieve, the dust and the rest of the lighter impurities are taken away by an air-blast and carried to the dust chamber. The grain is then further cleaned by passing over several sieves in the winnower, and finally passes through a rotary screen, which divides the large from the small grain and discharges it into the silos. From the silos the grain is either put into sacks, which is done by means of a spout on

the ground floor, or, if it is to be warehoused, it is run through a sort of gutter to a trolley, by which it is taken to the scales, which register automatically the weight of each truck-load on a ticket, and then to an elevator-hopper, whence the grain is discharged into its proper silo. Altogether there are four elevators, two for cleaning and two for discharging into the silos. The warehouse has in its fifteen silos 740 cubic metres of space, equal to about 9,000 cwt. of corn, or 46 wagon-loads. The silos are about 36 ft. high, and have a spout or shoot at the bottom, by which they can be emptied in a very short time. For the purpose of despatching grain by railway, the corn is loaded in sacks from an opening on the ground floor on to the railway waggons on the siding. The warehouse also contains room for storage of manures and feeding-stuffs, which the society purchases wholesale for disposal to its members.

WEATHER AND CROPS IN EUROPE IN 1904.

During the past summer, the Central and South-Eastern countries of Europe suffered in a marked degree from drought and extreme heat, and the crops, particularly maize, roots, potatoes, late hay and fodder crops, have in consequence been more or less injured, though it is probable that in the case of the cereal crops there may be some compensation in the improved quality of the grain.

In Germany, according to the Reports of the Imperial Statistical Bureau, the weather was unusually hot from about the middle of June, and the absence of rain in all parts of the Empire exercised an unfavourable influence on the cereal, and more especially on the fodder, crops. During the second half of June there were occasional showers which brought some relief to the crops, but from the commencement of July the dryness became general, accompanied by an almost tropical heat. The drought and heat continued undiminished until about the second week of August. Brooks and streams dried up, navigation on some of the canals and rivers was almost wholly suspended, and in many districts the water supplies failed ; in some places the dryness continued into September.

The weather, however, was excellent for harvesting, and the cereals were secured under favourable conditions.

The rainfall at nine places in Germany, according to the *Bulletin International Météorologique*, in the four summer months of 1903 and 1904 was as follows :—

Meteorological Station.	Rainfall in Inches.							
	1904.				1903.			
	June.	July.	Aug.	Sept.	June.	July.	Aug.	Sept.
Hamburg	1·44	·70	1·95	1·29	1·33	5·42	6·98	2·22
Swinemünde	1·17	1·60	·98	·86	2·18	1·29	4·33	2·46
Neu Fahrwasser ...	2·34	1·52	1·21	·66	1·52	2·30	3·74	1·64
Memel	1·48	·82	2·26	·98	·98	·94	6·01	1·13
Aix-la-Chapelle* ...	1·52	1·52	1·72	3·90	2·50	4·57	5·19	4·64
Weisbaden*	2·22	·74	·94	2·96	5·89	14·94	3·67	1·05
Berlin...	1·68	1·40	1·37	1·87	1·33	2·26	2·30	2·03
Breslau	1·01	·59	1·60	·35	2·11	4·29	3·00	·94
Carlsruhe	2·64	·86	2·22	3·24	1·79	6·24	2·50	1·72
Average of 9 Stations	1·72	1·19	1.58	1·79	2·18	4·69	4·65	1·98

* The figures for 1903 refer to the Stations at Munster and Frankfort respectively.

These figures, it may be thought, hardly reflect the severity of the drought reported by the Imperial Statistical Bureau, though it will be seen that the rainfall was abnormally low during the whole summer, and particularly in July, when it amounted to only about one inch, and in some districts to much less. From the references to the extreme heat, it is probable that the excess of bright sunshine led to a considerable increase in surface evaporation, and the occasional showers recorded at the meteorological stations, separated as they were by considerable intervals, were insufficient to alleviate the lack of moisture produced by the great heat.

The condition of the cereal crop was, according to the Official Returns, generally rather better than a medium crop, except in the case of oats. The potato, clover, and hay crops suffered very greatly from the dry weather, but by the middle of September there was some improvement, due to the later rains, which, especially in South Germany, produced a favourable effect on the clover, lucerne, and hay crops.

Like Germany, Austria-Hungary suffered from drought during

June and July, and up to the middle of August, when heavy rains fell in many parts of the country. Some indication of the weather may be obtained from the table given below.

The light rainfall in July last is noticeable at all the stations shown, and it will be seen that in some places it continued throughout August. So far as the cereal crops are concerned, the effects of the drought in Austria do not appear to have been very severe, though the yield is likely to be less than last year. Rain came in time to effect some improvement in the condition of maize and potatoes on good lands, but both these crops are stated to be very poor in many districts.

Meteorological Station.	Rainfall in Inches.							
	1904.				1903.			
	June.	July.	Aug.	Sept.	June.	July.	Aug.	Sept.
Vienna	1·05	·98	2·22	3·82	3·71	5·27	4·37	2·42
Prague	·51	1·13	·08	1·56	1·87	3·67	1·52	1·01
Cracow	1·83	1·17	3·98	2·11	4·06	11·86	4·91	·70
Lemberg	1·79	·74	1·99	·98	4·06	3·71	2·18	·39
Buda-Pesth	1·29	·66	·78	1·87	2·93	3·00	·82	1·76
Trieste	3·67	·35	5·66	5·27	3·71	4·45	·08	2·11
Lesina	·59	·31	·47	2·81	·59	·12	·08	·94
Average of 7 Stations	1·52	·74	2·18	2·68	3·00	4·56	1·99	1·33

In Hungary, all the crops suffered more or less from the long-continued drought. At Buda-Pesth the rainfall over the four summer months only amounted to about 4½ inches. The yield of wheat is put at 142,995,000 bushels as compared with 176,616,000 bushels in 1903. The quality is stated to be generally satisfactory. Barley suffered considerably from the heat and absence of rain, and oats were also referred to unfavourably in the Reports of the Hungarian Minister of Agriculture both as regards quantity and quality. The most serious deficiency, however, occurred in the maize crop, which up to the middle of August had been so seriously affected by the drought that a considerable proportion was regarded as lost. The later rains may have improved its condition to some extent, but on October 28th the crop (according to a report which appeared in *Dornbusch's Evening List*) was estimated at about

7,400,000 qrs. compared with 15,862,000 qrs. in 1903. The root and fodder crops were also very unsatisfactory, and it was expected that there would be a serious deficiency in cattle food. In anticipation of this a decree was issued on August 10th last prohibiting the export from the whole Customs Union of Austria-Hungary of molasses, maize, horse-beans, lupins, vetches, potatoes, fresh and dried fodder-grasses (*i.e.*, clover, hay, &c.), straw, chaff, bran oil-cake, grains, &c.

In Roumania, all the crops have suffered materially from the absence of rain, and the failure of the maize crop, which is not expected to yield more than one-third or one-fourth of an average crop, led to the total prohibition of the export. The duration of this prohibition, which was dated 4th August, has been extended to 15th October, 1905. The failure of this grain crop is of special importance from the fact that it forms the principal cereal food of the rural population, and the distress caused in some districts threatened to be so severe that the Government found it necessary to take steps to supply that cereal on easy terms to the poorer peasants. A sum of £140,000 was placed at the disposal of the Ministry of Finances for this purpose.

The absence of rain interfered in the same way with the growth of grass; and in view of the probable want of fodder, the exportation of cattle food, viz., hay, straw, oats, bran, and the residue arising from the manufacture of alcohol, sugar, beer, and vegetable oils, was prohibited from August 6th, 1904. The preliminary estimate of the crops published by the Ministry of Agriculture is as follows:—

	(In Thousands of Bushels).	
	1904.	1903.
Wheat	52,085	71,422
Barley	11,207	28,798
Oats	12,223	30,435
Maize	11,000	77,791

In Servia also the present year has been an exceptionally bad one for agriculture; the continued drought burnt up the maize, ruined the plum harvest, and prevented the second growth of hay. The poorer class of peasants, it is stated, are likely to experience a difficulty in feeding their catttle until the spring,

and the exportation of maize and hay has, therefore, been prohibited, while the importation of maize will be permitted free until further notice.

Bulgaria, on the other hand, seems to have been more fortunate, as it is stated in a report in the *Journal Officiel* that the weather was favourable for the wheat crop, rain coming at the right time with good weather for harvesting. The spring-sown crops, however, such as oats, barley, millet, and maize, suffered from the dryness, and the yield was expected to be indifferent.

The whole of the south of European Russia suffered from extreme drought, but the northern half of the Empire, on the other hand, felt the consequences of uninterrupted rain and extremely low temperature. In the south-west, particularly in the Governments of Bessarabia and Kherson, the absence of rain entailed disastrous consequences; it also caused substantial damage to the spring sowings of the Polish Governments. The rainfall in some parts of Central and South Russia will be seen from the following figures :—

Meteorological Station.	Rainfall in Inches.							
	1904.				1903.			
	June.	July.	Aug.	Sept.	June.	July.	Aug.	Sept.
Moscow	4·06	2·54	1·68	1·25	·66	3·67	3·35	·62
Warsaw	2·18	1·44	1·68	·62	4·29	4·80	1·83	·70
Kieff	2·42	·39	1·87	3·43	1·79	1·21	·82	·27
Kharkoff	2·57	·16	·82	1·87	4·17	4·41	·70	·27
Nicolaieff	·82	·39	·35	1·09	4·91	1·01	·31	—
Odessa	·55	·47	·66	2·85	1·21	1·33	·31	—
Average of 6 Stations...	2·11	·90	1·17	1·87	2·85	2·73	1·21	·31

It will be seen that the rainfall at the four southern stations of Kieff, Kharkoff, Nicolaieff, and Odessa was very small in July, and at the three latter ones in August also.

The yield in the 60 Governments of European Russia is estimated by the Central Statistical Committee as follows, and is stated by them to be below the average. It seems, however, from the diagrams published by the Committee, that the districts

in which the state of the crops is regarded as unsatisfactory are, proportionately, not very extensive.

	Millions of Cwt. 1904.	1903.
Winter Rye	389	432
Winter Wheat	60	78
Spring Wheat	160	175
Barley	115	151
Oats	219	202

Although it is chiefly in Central and South-Western Europe that the effects of the droughty season have been felt, it may be mentioned that a deficiency of fodder is reported from Norway and hay may now be imported into that country under certain restrictions.*

In the absence of reliable official data as to the production of the crops, the probable influence of the drought on the imports or exports of these various countries can only be surmised ; but it may be useful to note the extent of the trade in maize in the countries from which its export has been prohibited. In the case of Austria-Hungary, in 1902 the importation for the whole Empire was 679,000 qrs. and the exports 252,000 qrs. ; in the three preceding years the imports were somewhat larger, and in 1897 and 1898 the imports were 1,062,000 qrs. and 3,036,000 qrs. respectively, following on the poor harvest of 1897. From Roumania the exports in 1901 and 1902 were about 5,000,000 qrs. ; and from Servia 127,000 qrs. in 1902 and 285,000 qrs. in 1900. In 1898, however, Servia, as will presumably be the case this season, became an importing country to the extent of 105,000 qrs.

In conclusion, reference may be made to France, although that country did not suffer so severely from the want of rain as some other European countries. The final returns of the wheat harvest, published by the French Ministry of Agriculture, place the yield at a lower figure than any year since 1898. It is estimated that a production of 287,439,496 bushels was obtained from 16,148,601 acres as compared with a yield in the preceding year from 16,002,458 acres of 353,060,208 bushels. This is equal to a diminution of 18·5 per cent., or, comparing it with the decennial average yield of 314,380,535 bushels, a decline of 8½ per cent. It must be remembered,

* *Journal*, September, 1904, p. 348.

however, that the quality of the crop of 1903 is stated to have been distinctly inferior to that of the present year, the weight per bushel, according to the official figures in 1904, being 62·12 lb. against 61·69 lb. in 1903. The question of how far the deficiency in the present year's harvest is likely to affect the position of France as an importing country is a matter of uncertainty; but according to an article in the *Economiste Européen*, the stocks carried over from 1903 are not inconsiderable; but although these may enable the requirements to be nearly provided from home resources, it is anticipated that France is likely to be less independent of foreign supplies than has been the case in recent years.

The Hay Collector or Sweep-Rake.

The extension in the area of land laid down to grass makes the question of economy in hay-making one of increasing practical importance. Among the implements which have been introduced into this country with the object of dealing more economically or more rapidly with the hay crop is the sweep-rake or hay collector, of which a description was given by Mr. Primrose McConnell in this *Journal*, Vol. IX., No. 1, June, 1903. The Board have received some notes as to the use of this machine from a correspondent, who, after seeing it in use in the United States, has introduced it on his farm in the West of England. The writer observes that before purchasing new hay-making machinery he endeavoured to ascertain what improvements had taken place, and which of these were most likely to suit the farm. The American hay loader was strongly recommended by some persons who had found it work well on their farms, but others were giving it up and going back to the ordinary pitching of the hay by hand.

As some of the fields to be mown extended to thirty acres and were fairly level, and as it was not intended to draw the hay home, it was decided to try a collector. The first field in which the machine was used was ten acres in extent and bore a fairly heavy crop of clover. The collector brought its loads to the rick well, and left the ground clear and clean. Very little leaf was

knocked off: in fact, not more than if it had been pitched into waggons. The rick was placed for future convenience at one end of the field, and it was found that the collector brought the hay at

FIG. 1.—A HAY COLLECTOR IN WYOMING.

FIG. 2.—THE HAY-RAISER LIFTING THE LOAD ON TO THE RICK.

a good pace from the surrounding parts, but that when it reached the far side of the field the amount of ground cleared per hour was not sufficient to justify the time of a man and a pair of

horses. If, however, labour were scarce and waggons could not be employed, a boy with a pair of horses could keep the collector going, and the extra man to pitch could be dispensed with. When the collector arrived at the rick, the clover was found to be tightly packed in coiled layers, and it was hard work to pick it out and pitch it into the elevator. In America, no elevator or man to pitch from the ground is employed, for, as will be seen from the illustrations, Nos. 1 and 2, the hay is lifted by mechanical means.* The hay collector brings the hay to

FIG. 3.—THE HAY COLLECTOR IN USE IN ENGLAND WITH AN ELEVATOR.

the rick and deposits it on the raiser, the horses are backed off, and by an arrangement of pulleys the platform of the raiser is lifted by horse-power and the hay deposited on the rick.

This method of getting the hay on the stack is an excellent one in a dry climate where the ricks are humped together and do not sink much after being made, and where they are not thatched or built to any great height. It would, however, require modification for use in our climate. The hay-prong in some ways seems better than the elevator, as it can take up

* A device of this nature adapted to the English elevator is described and illustrated in the number of the *Journal* previously referred to, Vol. IX., No. 1, p. 6.

the load from the collector, and so save the pitching into the elevator. But even the hay-prong requires a strong lad or a man to work it, and when the load is dropped on to the rick it still has to be pulled to pieces in order to build the rick up properly. When the collector was worked in a grass field it cleared more ground, a higher load collecting on the teeth, and the grass did not coil up so much as the clover.

The collector is heavy pulling for the horses when loaded, and requires as much or more horse-power than a mowing machine. When it arrives at the rick the collector is backed by the horses and the teeth slide out under the load.

The arrangement for backing was not found very satisfactory in the English machine. In the illustration of the American machine (Fig. 2) it will be seen that breeching is used on the horses, and that a strap passes from the breeching under the horse to the head of the pole, and the pole chain is only used to keep the horse in its place. Another objection which might, however, be overcome by a mechanical alteration, is that it requires two men to pack it up when moved from field to field.

On the whole, however, it was considered that in fields of ten acres or over which were fairly level the collector did its work well. With a boy on the collector, a man on the ground at the rick, and a man and boy on the rick, more hay was got together in the same time than by two men and two boys with waggons. The writer suggests, however, that by a combination of the American raiser and English elevator, the services of the man at the foot of the stack might be dispensed with, as at hay-making time it is not merely a question of wages but of being able to get the hay rapidly together when it is made before rain comes to spoil it.

Rot in Turnips.

Some diseased turnips were recently forwarded to the Board for examination from Roxburgh, and they were found to be attacked by a minute fungus, *Sphaerella tabifica*, otherwise known as Beetroot and Mangold Rot. The disease is described as follows in Massee's "Text-Book of Plant Diseases":—About the month of August the largest leaves droop to the ground, as is frequently the case

during very hot, dry weather. This drooping, however, is due to the upper surface of the leaf-stalk having been more or less disorganised by a parasitic fungus, whilst patches are present, often 20–25 mm. long, and finally the tissue becomes brown and dead. The disease passes from the large leaf-stalks into the root, penetrating to the heart, and from thence attacking and killing the young heart-leaves.

The Board are advised that great care should be taken to confine the disease to the field where it originated, inasmuch as if the turnips are carried to other parts or find their way to the manure heap, the disease will certainly spread. The safest course would be to plough in the diseased crop and apply a good dressing of gas-lime or kainit early next spring. Neither turnips, mangold, nor beet-root should be sown for at least five years on land that has produced a diseased crop.

Turnip Mud Beetle.

Among turnip pests are the grubs of a beetle known scientifically as *Helophorus rugosus*, the Turnip Mud-Beetle. Both adult beetle and its grub are injurious, the beetle destroying the leaves and the turnip tops, and the maggots attacking the leaf-stalks and bulbs. In a case which was brought to the notice of the Board it was stated that the crop had been almost destroyed.

Where this insect is observed on growing turnips the wisest course is probably to dress the turnips with about 1 cwt. of nitrate of soda per acre. It should be noted that after an attack of maggot or grub, the results most to be feared occur in the next season on the turnips, if the field planted with these be very near a field previously infested with maggots. It is therefore strongly recommended that the next year's turnips should (as far as is practicable in the rotation), be sown as far as possible from the infested crop.

Diseases of Sheep in Great Britain.

During the spring of 1904 the Board of Agriculture and Fisheries received a number of reports which led them to suspect that, in some parts of the country at least, the abnormal rainfall of 1903, and the consequent wet condition of pasture lands, had led to an increase in the ailments to which sheep are liable. In some cases the Board were asked to furnish a remedy for some disease of which the local name alone was given, while in other cases the symptoms were but vaguely described. It was, consequently, difficult to identify the disease. With the object of acquiring some general information as to the condition of the flocks throughout the country, and of learning whether any special disease had been more than usually prevalent, the Board decided to send a circular to their Agricultural Correspondents asking for replies to the following questions :—

1. State the county and district about which you have information.
2. State what breed of sheep is usually kept in the district.
3. State whether any disease, fatal or otherwise, has during the past twelve months occurred in your district, and if so, whether it attacked (1) all sheep, (2) ewes, or (3) lambs. Give local name of disease, if known.
4. State, if possible, the exact localities in which some of the worst cases have occurred.
5. State the nature of the soil where the disease is most frequently found, and whether it is worst amongst sheep on (*a*) permanent pasture, (*b*) temporary leys, or (*c*) folded crop.
6. State whether disease is attributed to any special condition of weather, pasture, or crop.
7. State whether it is customary to call in a veterinary surgeon, or whether the farmer or shepherd treats the cases.
8. What proportion of the flock is generally attacked? Give the approximate percentage of recovery and death amongst affected animals.

The Correspondents were also asked to describe the symptoms (1) preliminary ; (2) during the course of disease ; (3) at the time of death ; and (4) during recovery.

About one-half of the Correspondents found themselves in a position to comply with the Board's request, and although in some instances the forms were but imperfectly filled up, in many cases it is evident that a great deal of trouble was taken to make enquiry throughout the district with which the Correspondent was acquainted as to the prevalence or otherwise of disease. The information obtained is therefore of consider-

able interest, and is likely to be useful in the future work of the Board.

The state of affairs revealed may, on the whole, be considered exceedingly satisfactory. In spite of the abnormally wet season of 1903, there appears to have been very little increase of ordinary ailments and apparently no outbreak of any special disease. In some places the reports are exceedingly good. In Durham, it is stated that "considering the wet autumn and winter, the disease among sheep has been extremely small, and only the usual ailments incidental to every flock have been reported in the district." In South Nottinghamshire during the past year the disease amongst sheep is stated to have been much below the average. From West Sussex, the reply is sent that flocks have been exceptionally healthy, having regard to the abnormally wet season they have been through, and losses have been lighter than usual. The district round Peterborough is declared to be very free from disease. A Correspondent in Cambridgeshire, who made careful enquiries from the chief sheep farmers in his neighbourhood, states that with only two exceptions they all reported freedom from disease, and he points out that as this represents flocks of ewes to the aggregate of between 5,000 and 6,000, it must be considered very satisfactory. In Wirral, the Correspondent, after making enquiries from the large sheep owners, states that he did not hear of any abnormal losses, with the exception of a few more breeding ewes being lost through the very wet autumn on some of the low-lying and stiff clay-lands. Many others say that they have heard of no disease, or nothing out of the common, except minor ailments. A Correspondent in Westmorland gives as an ordinary death-rate 5 to 7 per cent. from all causes, apparently among the ewes only, and it would seem that a death-rate as high as this is not regarded as exceptional.

A number of cases of Liver-fluke are reported to have occurred, especially among the ewes and at lambing time. The cause is in every case ascribed to the wet season, but the losses, on the whole, do not seem to have been heavy. Liver-fluke was reported to be more serious in Scotland than in England. One Correspondent says there was a little more than usual; according to another, 10 to 30 per cent. were attacked, few recovering; while a third puts the rate of mor-

tality at from one-fifth to one-half of the flock. In another part of Scotland it is said that one farmer lost 90 to 100 ewes out of his stock of about 250. In a more favoured district 5 per cent. only were attacked, but there were no recoveries, while elsewhere the average is said to be only 5 to 10 per cent.; an outbreak, however, is reported on temporary ley in which 80 per cent. died.

Foot-rot was prevalent, and in regard to this disease, a Correspondent observes that there is much trouble nowadays in getting shepherds to properly attend to and dress the sheep when attacked, with the result that through neglect some sheep get into a deplorable state. The statement is also made by other Correspondents that this disease has almost disappeared since the use of foot-rot baths became common.

Louping-ill is reported by the Correspondents in the North, where it is said 15 per cent. died, and this disease is reported from numerous districts in Scotland. An investigation is being conducted into this disease by a Departmental Committee appointed by the Board.

Black-quarter, Quarter-evil or Felon, is said to be prevalent on the stronger soil of Dorsetshire overlying the chalk, and occurs most frequently on rich permanent pasture; seldom on the poor, thin downs. Professional help is seldom invited, the general practice being to change the sheep to poorer land. The percentage attacked naturally varies considerably. In one flock of 500 about 70 ewes have been lost since last autumn. Other cases have occurred of from 10 to 20 being lost in flocks of a similar size.

Scour has been declared in certain districts. Among the Cheviot hills, Black-scour occurred in the wet weather of March and the beginning of April, especially where land was not well drained, or where there was a want of heather. In a bad season, it is stated, 25 per cent. of the hoggs may be attacked and few recover. A serious outbreak of "White-scour" occurred in Essex among a valuable flock of registered Suffolk sheep. The land on which it commenced was temporary ley folded with sheep in June, 1903, then ploughed up and sown with white turnips; on folding these turnips in the spring of this year the scour amongst the lambs started, and it is to this second folding that the out-

break is attributed. The ewes and lambs were moved to low-lying pasture without effect. In this case two-thirds of the lambs were affected, and out of a total of 570 no less than 234 died. In another part of the same county (Essex), a number of sheep imported from Yorkshire, Perthshire, and Aberdeenshire suffered from scour. Five per cent. were affected only, but none recovered. In Worcestershire and South Shropshire, it was found that lambs were not infrequently attacked by scour and wasting about weaning time, the death-rate being about 2 or 3 per cent. among the lambs.

The disease known by the various names of Navel-ill, Joint-ill, or Big-joint, claimed many victims. In one part of Lincolnshire an outbreak was investigated by one of the Board's Inspectors, and his report on the subject has been reproduced in this *Journal.** The disease was reported from several other districts in the same county, and in one case 50 lambs out of 250 were affected, of whom perhaps 10 per cent. recovered, but were of little value.

While it is not possible to state exactly what parts of the country are most affected, or what disease is most prevalent, it would seem that, so far as the returns go, disease is more prevalent in the Northern Counties. Louping-ill, Staggers, Black-scour, Swingback, and Grass-ill are reported from Northumberland, the second disease occurring also in the West Riding and in Lancashire. Fell sickness occurs in West Cumberland. Lincolnshire, especially in the north, has suffered severely from Navel-ill; Essex from Scour; Kent and Sussex from Black-quarter and Rheumatism. Northamptonshire has suffered from Gid, the sheep being Cheviot or cross-bred Cheviots and Border Leicesters imported from the North. Wind Gargate is reported from the same district, but on the whole the Midlands seem to have been free from disease, while the counties lying to the south of the Midland Counties have been exceptionally favoured. Fluke is reported from Dorset, Lancashire, Oxfordshire, Warwickshire, the North Riding of Yorkshire, and may possibly have existed in other places. Foot-rot is said to occur in Cambridgeshire, Cumberland, Devon, Dorset, Hampshire, Herefordshire, Mon-

* *Journal*, Vol. XI., No. 2, p. 110.

mouthshire, Norfolk, Shropshire, Surrey, Warwickshire, Wiltshire, and Yorkshire North Riding.

The returns from Wales were of a fairly satisfactory character, though no information was received respecting certain counties.

The distribution of diseases in Scotland is very general. Louping-ill, Braxy, and Trembles are reported from Argyll, Berwickshire, Bute, Clackmannan, Dumfriesshire, Inverness, Skye, Lanark, Midlothian, Peeblesshire, Perthshire, Renfrew, Ross, Roxburgh, Selkirk and Stirlingshire; Udder-clap from Berwickshire, East Lothian, Roxburgh and Selkirk; Liver-fluke from Argyll, Caithness, Renfrew, and Wigtownshire; Swingback from Aberdeenshire, Dumfriesshire; Navel-ill from Forfar; and Sturdy from Roxburgh. In some counties no serious attacks of disease are recorded, but the past year is reported as being an exceptionally bad one for sheep farming in Argyll and Ross.

Butter Legislation in Belgium.

The Butter Law which is now in force in Belgium was passed in 1903, and a translation is given in the minutes of evidence of the Butter Regulations Committee.* By this law the sale of butter containing an excess of water was made subject to the following regulation:—"Butter containing more than 18 per cent. of substances other than butter-fat and salt cannot be sold, delivered, placed on sale, stored, or despatched for sale or for delivery unless it be labelled or placed in a cover marked very distinctly as 'Butter mixed with water.'"

This provision has been found inadequate, and the law has, in this respect, been recently amended by a decree which received the Royal sanction on the 18th September, 1904. The new regulation provides that butter containing more than 18 per cent. of substances other than butter-fat and salt may not be sold, delivered, exposed for sale, kept or conveyed for sale or delivery, unless it is enclosed, for the wholesale trade, in wooden receptacles hermetically closed; and, for the retail trade, in paper or cardboard packages tied in two directions with twine sealed

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* *Minutes of Evidence to the Final Report of the Butter Regulations Committee* (*Cd.* 1750) *Appendix* xxxv. (II.) *p.* 645.

with wax or lead. The nature and exact proportion of the substances other than butter-fat and salt must be indicated in heavy but distinct type, printed directly on the wrapper in the form of an oblong "notice" which must appear on two opposite faces of all the wrappers, *i.e.*, not on the exterior one only. The "notice," which must be in French on one face and in Flemish on the other, is as follows: "BUTTER MIXED WITH WATER. Notice.—This butter contains . . . per cent. of water (casein, lactose). Pure butter does not contain more than 18 per cent." Every "notice" must be strictly in accordance, as regards its wording and shape, with a model label which is printed in the body of the regulation. The label is very nearly 3 in. in width and a little more than 1¼ in. in height. The type used in the model "notice" shows the minimum size which may be used, and for the wholesale trade the size of the type and of the label must be trebled. The "notice" must be isolated from any other lettering, and it must be completely visible on two faces of the package. It is forbidden to insert on the wrapper any information other than an indication of the business of the producer or seller; and the above-mentioned "notices," or analogous ones, must not be inserted on wrappers containing pure butter.

Experiments in Fattening Turkeys.

In connection with the article which appeared in the October number of this *Journal*, it has been pointed out that no statement was given of the cost of the food consumed, or of the initial cost of the birds. Mr. de Courcy has therefore furnished the following supplementary information:—

The turkeys were raised on a farm together with other poultry and stock of various kinds, and no exact account was kept of the cost of raising them from the shell up to the time when they were put into the fattening pens. From experiments made in previous years, it may be estimated that the cost of raising turkeys from the middle of April or the beginning of May to the end of the third week in November would be 6s. a head

for cocks and 4s. for hens. It will easily be understood that the cost depends on many circumstances, particularly the current prices of food stuffs. But this estimate refers to turkeys raised on a farm where most of the foods required were grown; and, with corn, roots, and potatoes at average prices, the amounts mentioned will not be found too high.

From the 24th of November, 1903, when the experiments described in the *Journal* were commenced, up to their conclusion, a strict account was kept of the cost of all the food consumed by the three lots of birds under trial, and the particulars thereof are reproduced in the following table :—

Lot.	Cost per head of food consumed in first ten days.	Cost per head of food consumed in remainder of fattening period.	Total cost of food consumed per head.	Total cost of food consumed per lot of ten birds.
No.	s. d.	s. d.	s. d.	s. d.
1	0 11	0 6	1 5	14 2
2	0 11	0 7½	1 6½	15 5
3	0 11	0 9½	1 8½	17 1

The cost is based on the market prices of the various articles of food which were fed to the turkeys, and these were as follows:— Potatoes, 6s. 8d. per barrel; turnips, 10d. per barrel; barley meal, 6s. per cwt.; Indian meal, 7s. per cwt.; ground oats, 6s. per cwt.; linseed meal, 11s. per cwt.; animal fat, 12s. per cwt.; and skim milk, 2d. per gallon.

At first sight it would seem that when the cost of food is deducted the profits realised from fattening turkeys are not very great, but we must not lose sight of the fact that by the process of fattening the birds are so considerably improved, both in weight and quality, that their selling value is materially increased, for whilst a 13-lb. bird, for instance, might be sold at 10d. per lb., the value of the same bird when fattened up to 15 lb. would be 11d. per lb.

It should be pointed out also that Diagram No. 1, on p. 386, has been drawn on a scale of three-fourths of an inch = 6s. 8d., instead of 1 in. = 6s. 8d. as stated.

Roadside Planting of Fruit Trees.

In some parts of the Continent it is the practice to plant fruit trees in suitable positions along the roadside in place of the ornamental or forest trees more usually employed. The subject was discussed at the International Congress on Arboriculture of 1900, and a resolution was passed to the effect that in view of the injury which is caused to adjoining lands by the presence along the roads of large trees with their far-reaching roots, the planting of fruit trees in their place should be encouraged. In France, during the past fifteen years, pear and apple trees have been planted in places along the national roads, and in 1901 it was stated that there were half a million fruit trees planted along French roads. As an example, it may be mentioned that in the Department of l'Oise a distance of 182¾ miles has been planted with 57,795 trees, the total length suitable for fruit trees being 257¾ miles. The cost of planting and purchasing the trees is about the same as that of ornamental trees, and the sale of the fruit yields a small annual return. Apart, however, from the return, it is contended that the fruit tree serves equally well for shade, that its appearance when in flower is picturesque, while it serves the subsidiary purpose of interesting the population in the growth of fruit. The employment of the less edible varieties of fruit is recommended, and the cider apple is, perhaps, the most commonly used. The practice prevails also in parts of Germany. In Hanover there were in 1901 189,586 trees planted on the roadside by the Provincial Government, which produced a revenue of £8,386, although a considerable proportion of the trees were not in full bearing.

Powdery Mildew of the Vine.

Powdery mildew of the vine is a destructive disease caused by a minute parasitic fungus—*Uncinula spiralis*. The conidial stage of this fungus has been known in this country since 1845, when it was described by the Rev. M. J. Berkeley under the name *Oidium tuckeri*. It is probably a native of the United States, where it is common on both wild and cultivated vines.

The vines should be sprayed with a solution made by dissolving one ounce of potassium sulphide in three gallons of

water. The first application should be made about a fortnight before the flowers expand, the second when in full bloom, care being taken at this time not to use too much force in spraying, in order not to injure the flowers. A third spraying may follow after an interval of three or four weeks if the mildew has not been completely destroyed. All diseased foliage and fruit should be collected and burned.

During the winter, when the vine is resting, the trunk and branches should be thoroughly drenched with a wash consisting of one pound of sulphate of copper dissolved in 25 gallons of water. The soil, walls, glass, &c., should also be drenched with this solution, which, it is very important to remember, should only be applied during the winter, before the leaf-buds begin to swell, otherwise the foliage will be completely destroyed.

The Asparagus Fly.

The Asparagus Fly, *Platyparea poeciloptera* (*Ortalis fulminans*), is a small fly, the prevailing colour of which is brown. The thorax, head, and legs are glossy brown, and the antennæ and face yellow-brown; the abdomen is brown-black, and shows at its hinder end four rather light transverse lines. The two wings, somewhat rounded at their ends, are marked by zigzag stripes. The body of the female is pointed, and bears a well-marked ovipositor, whilst the end of the male is rounded. Both male and female are hairy.

The larva is a roundish, glossy, and legless maggot, which is yellowish in colour; at the dark head end are two easily-distinguishable gnawing mouth hooks; at the hind end, which is somewhat flattened, is a black-brown plate, to which are attached two hook-shaped or anchor-like processes. Full grown, the maggot measures about half an inch.

The pupa is barrel-shaped; at first it is light yellowish-brown in colour, but later it becomes darker, and is slightly flatter on the under surface than on the upper; a short, anchor-like double hook is at the hind end.

The flies issue from early in April until about the middle of July, and lay their eggs beneath the scales of the asparagus heads as these are appearing through the soil, or in the neighbourhood of the leaves.

In a few days, or, according to some authorities, in a fortnight to three weeks, the larvæ hatch out and bore into the tender stalks and young shoots. The maggots work directly down the stem, and their presence is marked by yellowish galleries or tunnels ; these last are often too deeply seated to be seen without dissection. Pupation takes place from June onwards, according to the time of egg-laying, but is practically over by August. It is considered probable that there may be two generations in the year. The pupæ hibernate in the underground portion of the stem.

The affected shoots become brownish or yellow in colour, and are stunted and decomposed, rotting finally below the ground

a. Male. *b.* Female, both magnified (after Taschenberg).

or at the point where they emerge from the soil. They occasionally show a bluish colour.

Treatment.

1. Where the area to be treated is small and easily examined, good results may follow if small rods dipped in a sticky substance are stuck in the ground early in spring. The flies will settle on these and be caught.

2. The flies may be collected early in the morning when they are resting on the tops of the asparagus shoots.

3. Taschenberg recommends sprinkling the tops of the shoots, when the dew is on them, with powdered charcoal ; this deters the flies from egg-laying.

4. In the summer all injured stems should be cut away and burned. In autumn all remaining stems showing larval tunnels and all dry stumps should be dug up and burned, so that injury in the following year may be lessened or prevented by the destruction of the pupæ.

Tulip Mite.

The Tulip Mite, which is a minute but widespread pest, does not confine its ravages to tulip bulbs, but willingly attacks bulbs of hyacinth, lily, eucharis, onion, dahlia, potato tubers, &c., and can pass from one of these plants to the other. It has the habit of burrowing under cover of the bulb scales, and successful treatment is very difficult. If the number of bulbs infected is small, burning these rather than attempting to treat them would be the wisest plan, so as to prevent the risk of the pest passing to others.

As a remedial measure, fumigation with sulphur has been tried, and the spraying of affected bulbs with paraffin has been recommended. Probably a better result would be obtained by enclosing the infested bulbs in an air-tight chamber and exposing them to the vapour of bisulphide of carbon; 1 pint of carbon bisulphide would serve for 1,000 cubic feet of space. The saucer or open plates containing the bisulphide of carbon should, when introduced into the air-tight chamber containing the bulbs, be laid down on the top of or above the bulbs, as the vapour that comes away is heavy and sinks. The bulbs should be exposed to this treatment for 24 to 36 hours, which should be repeated in a week. Bisulphide of carbon fumes are very poisonous and must not be breathed, and no naked light must be brought near them.

Black Currant Gall Mite.

With reference to the experiments referred to in the October number of this *Journal* (p. 435), it may be added that the spraying of bushes infected with Black Currant Gall Mite was commenced when the buds began to burst, in 1901 on April 19th, and in 1902, 1903, and 1904 on the 12th, 30th, and 26th of April respectively. The spraying was done twice a week, and continued until about the middle of June, each bush being sprayed on an average fourteen times.

Protection of Fruit Trees against Blue Tit.

The Blue Tit (*Parus cæruleus*) is a pretty little bird about four and a-half inches in length. The wings and tail of this species are blue, the breast and belly sulphur-yellow, the back yellowish-green, and the side of the head white with a blue band running across it from the beak to the nape. Its nest of

moss, hair, and feathers is built in holes in trees, walls, or gate posts, and sometimes in pumps, letter-boxes, and other extraordinary places. Insects appear to be the principal objects of its search during the summer, and in the winter this tit feeds upon seeds, eggs and pupæ of insects and anything it can pick up.

There is no doubt, however, that the Blue Tit occasionally damages apples and pears by pecking holes in the base, and it is believed that this may occur even when no insects are in the fruit. A correspondent points out that this bird has frequently done damage to his pear crop by perching above the stalk of the fruit when nearly ripe and pecking it, thus causing it to fall or in any case to be unsaleable. In the case of large and valuable pears grown on bushes, the use of small shields of cardboard was found to afford complete protection. The shields were about two inches square, with a hole in the centre and a slit on one side to enable them to be placed round the stalk of the pear.

Diseases of Coniferous Trees.

Specimens of Douglas Fir (*Abies douglasii*) from Surrey show a disease not hitherto recorded for this country, although it has been observed on the Silver Fir (*Abies pectinata*) in Italy.

The injury is caused by a minute fungus called *Phoma dura*, which attacks the extreme ends of the shoots, killing the leaves and the terminal bud. The injured leaves and bud become brown and contract into a compact tuft, which is eventually removed by wind. The spores of the fungus mature on the fallen leaves.

The Swiss Stone Pine (*Pinus cembra*) has, unfortunately, to be added to the list of conifers susceptible to the attacks of "Larch canker" (*Dasyscypha calycina*), several trees growing in Surrey being badly attacked by this parasite.

The Japanese Larch (*Larix leptolepsis*) has also succumbed to "Larch canker." Specimens from two localities in Scotland, brought to Kew for investigation by Dr. A. Henry, show the characteristic wounds and resin-flow, also spermogonia of the fungus on living branches. On dead branches the perfect condition of the fungus is also present.

The information collected by the Board of Trade as to the rates of agricultural wages showed that a further rise took place in 1903, the amount of increase being greater than in 1902 but much less than in any one of the preceding five years. The number of agricultural labourers in districts in which wages were reported to have changed in 1903 was 76,048, as compared with 93,654 in 1902. Of these 76,048 labourers, 51,095 were in districts where the wages increased, while in the case of the remainder wages were reduced. In the remaining districts in England and Wales no change was reported. The net increase in the districts where a change was reported was £556 per week, as against £312 in 1902 and £3,161 per week in 1901. The Eastern and Midland group showed the most marked falling-off in wages; in the Southern and Western counties, where complaints of the scarcity of farm labour have been most numerous in recent years, the number of labourers in districts where increases took place is much larger than those in districts where wages fell. With regard to Scotland, the reports show that the rates of wages paid to male farm servants in 1903 were, generally speaking, at about the same level as in 1902. At the spring hirings there was a slight upward tendency in wages. In the latter half of the year, owing to the bad harvest, farmers tried to secure reductions in wages, but only those farm servants who were seeking new situations had to face any serious movement for lower wages, and in the main rates remained unchanged. Young lads and women servants continued to be scarce, and commanded relatively high wages.

Agricultural Wages in 1903, and Harvest Wages in 1904.

Returns have been furnished to the Department relating to 97 farms in the Eastern, Midland, and Southern counties of England showing the cash earnings for the corn harvest of 1904 of 1,233 agricultural labourers, exclusive of the value of food and drink which may have been provided for them in addition to their money wages.

The corn ripened quickly this year and harvesting was commenced earlier than usual. Self-binding machines were very extensively used, as the corn stood up well, and, consequently, there was not much demand for extra men, and most of the

harvest work was done by the regular staffs of the farms in a number of localities. In some districts of the Eastern counties several men failed to secure harvest engagements, and had to content themselves with turnip hoeing and other work at ordinary rates of wages.

The average duration of the harvest on the 97 farms covered by the returns was 24 working days. The corresponding figure for 1902, when the harvest was prolonged by unfavourable weather, was 33 days. In 1901 the average was 24 working days. In that year, as in the present one, the weather was most favourable and the crops were secured quickly. Returns were received relating to the harvest of 1903, but as the harvest was so protracted owing to bad weather, during which labourers were in many instances employed at other farm work on ordinary wages, satisfactory averages could not be compiled.

The earnings were highest (£7 5s. 7d. per man) in the Eastern counties, which include the great corn-growing counties of Huntingdon, Cambridge, Lincoln, Norfolk, Suffolk, and Essex. The payments in this group of counties ranged from about £6 10s. to £8, though more was earned by some men on piece-work in the Fen districts. In parts of Norfolk and in Suffolk and Essex the usual system of payment is for the labourer to contract with the farmer to perform the harvest work for a fixed sum, irrespective of the number of days occupied. A short harvest, as in 1901 and this year, is thus a profitable one for the labourer, as he gets back to ordinary farm work at weekly wages sooner than in years such as 1902 and 1903, when harvest was lengthened by unfavourable weather.

In the Midland counties the average harvest earnings, according to the returns received, were £5 13s. 6d. per man, or £1 12s. 1d. less than in the Eastern counties, while 392 farm labourers in the Southern and South-Western counties earned on an average £4 17s. 2d. each only. In the Midland and Southern groups of counties the systems of payment are frequently on a time-work basis, and harvest earnings fluctuate from year to year according to the duration of the harvest. In 1902, when the harvest was long, the average earnings for the Midland labourers were £6 14s. 11d., and for those in the Southern counties £5 17s., or £1 4s. 5d. and 19s. 10d. more respectively than in 1904.

The various methods of payment are as follows (apart from the Eastern counties, for which the general method of payment has already been described):—To give the work in separate portions as piecework; to give the ordinary weekly wages and, in addition, a bonus of a pound or two at the end of harvest; to give extra time wages for a month certain, and then to pay the ordinary weekly wages; to pay double the ordinary weekly wages during harvest; to pay a certain rate per day as long as harvest lasts. Occasionally the ordinary weekly wage is paid and overtime money given.

In addition to cash payments, beer or cider is frequently given, and in some cases light refreshments, such as tea, bread, butter and cheese.

Recent Publications of the Board.

The Board have now issued in book form (price 6d.) the complete statistics relating to the acreage under crops and the number of live stock in 1904 for Great Britain, with a summary for the United Kingdom and comparative tables for a series of years. An alteration has been made in the form of the comparative tables which it is believed will render them more convenient for reference, and the Summary Table (I.) has been extended so as to show concisely the changes which have occurred in 1904 as compared with the preceding year. A preliminary statement showing the estimated production of hops in England in 1904 and 1903 was published on October 7th.

The following leaflets have also been issued since the previous notice in this *Journal* (August, 1904, p. 305), and single copies may be obtained free of charge on application to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W.:—The Cabbage Moth (No. 109); Coral Spot Disease (No. 115); Black-Leg or Potato Stem-Rot (No. 117); The Sheep Nostril Fly (No. 118); and Sturdy or Gid in Sheep (No. 119).

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of October, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 8	7 3	38 7	34 9
Herefords	7 6	6 11	—	—
Shorthorns	7 6	7 0	37 6	33 11
Devons	7 10	7 4	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	$7\frac{3}{4}$	7	$8\frac{1}{2}$	7
Sheep :—				
Downs	$8\frac{1}{2}$	$7\frac{3}{4}$	—	—
Longwools	8	$7\frac{1}{4}$	—	—
Cheviots	$8\frac{3}{4}$	$8\frac{1}{4}$	$8\frac{3}{4}$	$7\frac{3}{4}$
Blackfaced	$8\frac{1}{4}$	$7\frac{3}{4}$	$8\frac{1}{2}$	$7\frac{1}{2}$
Cross-breds	$8\frac{1}{2}$	$7\frac{3}{4}$	9	8
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	5 9	5 5	5 10	5 2
Porkers	6 4	6 1	6 6	5 9
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
In Milk	21 2	18 2	20 14	17 1
Calvers	20 8	17 3	19 10	16 0
Calves for Rearing	2 3	1 15	1 14	1 3
Store Cattle :—				
Shorthorns—Yearlings ...	9 9	7 19	10 8	8 8
,, Two-year-olds	12 17	11 14	14 10	12 7
,, Three-year-olds	16 8	14 9	16 8	14 2
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools—Hoggs, Hoggets, Tegs and Lambs	35 3	31 3	—	—
Scotch Half-breds ,, ...	—	—	29 6	25 1
Store Pigs :—				
Under 4 months	23 0	17 4	21 10	15 9

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of October, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	52 6	50 2	47 10	50 2	54 10*	57 2*
	2nd	50 2	44 4	40 10	44 4	—	45 6*
Cow and Bull ...	1st	—	43 2	40 10	44 4	44 4	37 4
	2nd	—	37 4	35 0	37 4	37 4	32 8
U.S.A. and Canadian :—							
Birkenhead killed	1st	52 6	47 10	46 8	49 0	47 10	50 2
	2nd	47 10	42 0	39 8	40 10	39 8	42 0
Argentine Frozen Hind Quarters ...	1st	26 10	26 10	25 8	29 2	29 2	30 4
American Chilled Hind Quarters ...	1st	57 2	56 0	54 10	52 6	57 2	57 2
VEAL :—							
British	1st	66 5	59 6	63 0	65 4	—	—
	2nd	59 6	47 10	52 6	54 10	—	—
MUTTON :—							
Scotch	1st	74 8	—	71 2	74 8	74 8	71 2
	2nd	68 10	—	65 4	65 4	65 4	54 10
English	1st	66 6	66 6	67 8	72 4	—	—
	2nd	60 8	54 10	61 10	64 2	—	—
Argentine Frozen ...	1st	35 0	35 0	35 0	35 0	35 0	36 2
LAMB :—							
British	1st	—	66 6	—	72 4	74 8	68 10
	2nd	—	58 4	—	63 0	66 6	57 2
New Zealand ...	1st	53 8	54 10	52 6	54 10	56 0	—
	2nd	51 4	—	—	51 4	54 10	—
PORK :—							
British	1st	56 0	58 4	60 8	58 4	51 4	53 8
	2nd	47 10	47 10	56 0	47 10	—	46 8

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each of the under-mentioned Weeks in 1904, and in the corresponding Weeks in 1903 and 1902.

Weeks ended (*in* 1904).	Wheat.			Barley.			Oats.		
	1902.	1903.	1904.	1902.	1903.	1904.	1902.	1903.	1904.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 2 ...	27 7	25 0	26 3	26 7	23 11	22 1	19 10	16 10	15 5
,, 9 ...	27 8	24 11	26 6	26 7	24 1	22 6	20 0	17 0	15 7
,, 16 ...	27 8	24 11	26 11	26 11	24 1	22 3	20 0	16 10	15 9
,, 23 ...	27 7	25 0	27 3	26 7	24 1	22 4	20 3	16 11	15 11
,, 30 ...	27 4	25 4	26 11	26 7	24 3	22 3	20 2	17 0	15 8
Feb. 6 ...	27 2	25 6	26 9	26 9	23 9	22 4	20 3	16 11	15 11
,, 13 ...	26 11	25 6	26 8	27 5	23 7	22 2	20 3	17 1	15 9
,, 20 ...	27 1	25 4	26 11	26 11	23 4	22 7	20 4	17 1	16 0
,, 27 ...	27 1	25 3	27 10	26 8	23 2	22 4	20 5	17 1	16 3
Mar. 5 ...	27 0	25 3	28 8	26 8	23 1	22 6	20 5	17 1	16 5
,, 12 ...	27 1	25 1	29 1	26 6	22 10	22 5	20 6	17 0	16 8
,, 19 ...	27 1	25 1	28 6	26 4	22 9	22 9	20 6	16 10	16 7
,, 26 ...	27 2	25 2	28 2	27 2	22 4	22 8	20 7	17 0	16 7
Apl. 2 ...	27 3	25 3	27 11	26 5	22 6	22 10	20 6	17 0	16 6
,, 9 ...	27 5	25 4	27 10	26 7	21 10	22 5	21 0	17 2	16 5
,, 16 ...	27 7	25 6	27 9	27 1	21 6	22 6	21 1	17 3	16 4
,, 23 ...	28 9	26 1	27 9	26 5	21 9	22 0	21 6	17 9	16 4
,, 30 ...	29 9	26 10	27 8	27 5	22 1	21 1	21 10	18 0	16 3
May 7 ..	30 9	27 6	27 4	26 10	21 10	20 8	22 6	18 2	16 7
,, 14 ...	31 1	27 9	27 1	25 3	22 5	19 10	22 5	18 4	16 6
,, 21 ...	31 6	27 10	26 9	25 4	23 7	20 4	22 6	18 5	16 7
,, 28 ...	31 6	27 8	26 9	25 1	23 7	19 8	22 10	18 5	16 7
June 4 ...	31 3	27 6	26 10	24 3	23 10	18 8	22 11	18 4	16 8
,, 11 ...	30 11	27 8	26 6	23 8	21 5	18 5	22 8	18 7	16 10
,, 18 ...	30 6	27 6	26 5	23 5	20 7	18 2	23 0	18 3	16 8
,, 25 ...	30 5	27 6	26 5	24 3	22 0	19 2	22 9	18 6	16 10
July 2 ...	30 8	27 9	26 4	25 5	20 7	18 8	22 5	18 6	17 1
,, 9 ...	30 10	28 1	26 6	24 8	19 11	19 8	22 10	18 3	17 1
,, 16 ...	30 11	28 3	26 10	23 8	20 5	18 9	22 10	18 7	17 6
,, 23 ...	31 5	28 7	27 7	25 0	20 10	18 10	22 8	18 5	17 6
,, 30 ...	31 8	28 11	28 0	25 0	21 0	19 9	22 10	18 6	17 10
Aug. 6 ...	31 7	29 3	28 3	24 11	20 1	19 9	22 11	18 8	17 10
,, 13 ...	31 7	29 11	28 4	24 9	21 3	19 9	22 2	18 10	17 7
,, 20 ...	31 5	29 9	28 8	22 10	20 4	22 5	21 11	18 6	16 7
,, 27 ...	31 7	30 0	29 5	26 2	22 3	23 2	21 0	18 7	16 5
Sept. 3 ...	29 9	30 3	30 2	24 6	22 5	25 3	19 10	18 5	16 3
,, 10 ...	27 10	28 6	30 0	27 5	22 4	24 10	19 2	17 0	16 1
,, 17 ...	27 1	27 5	29 7	26 4	24 2	24 9	18 4	16 4	15 11
,, 24 ...	26 6	27 0	29 10	26 4	24 0	25 10	18 0	16 2	15 9
Oct. 1 ...	25 10	26 3	29 10	25 11	23 9	25 5	17 5	15 9	15 8
,, 8 ...	25 5	25 10	30 2	26 2	23 8	25 6	17 2	15 6	15 9
,, 15 ...	25 1	25 8	30 5	26 1	23 9	25 4	17 0	15 5	15 8
,, 22 ...	24 11	25 10	30 4	26 4	23 7	25 5	17 0	15 8	15 11
,, 29 ...	25 0	26 0	30 6	26 7	24 2	24 11	17 3	15 8	15 10
Nov. 5 ...	25 1	26 4	30 6	26 3	24 3	25 0	17 2	15 9	16 0
,, 12 ...	25 0	26 6		25 11	24 6		17 3	15 9	
,, 19 ...	24 11	26 9		25 6	24 3		17 2	15 10	
,, 26 ...	25 0	26 6		24 11	23 11		17 0	15 11	
Dec. 3 ...	25 1	26 8		24 4	23 9		17 0	15 9	
,, 10 ...	25 0	26 7		24 3	23 2		16 10	15 9	
,, 17 ...	24 10	26 9		24 2	23 0		16 10	15 7	
,, 24 ...	24 10	26 5		24 1	22 5		16 8	15 6	
,, 31 ...									

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1903.	1904.	1903.	1904.	1903.	1904.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	September ...	36 2	37 5	22 7	22 7	17 4	17 4
	October ...	36 1	38 0	22 6	23 0	17 0	17 6
Paris:	September ...	36 4	38 7	23 2	23 7	17 6	19 0
	October ...	36 4	40 4	22 8	23 3	17 2	18 11
Belgium:	August ...	28 10	30 0	22 11	21 6	19 8	19 4
	September ...	27 11	30 11	22 1	22 4	15 9	18 7
Berlin:	July... ...	36 11	37 10	—	—	18 3	20 0
	August ...	35 9	39 0	—	—	19 10	20 8
Breslau:	July ...	32 1	38 3	22 10	23 2	17 11	18 8
	August ..	33 11	38 0	22 10	24 7	17 10	18 9

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets.*

AVERAGE PRICES of **British Wheat, Barley** and **Oats** at certain Markets during the Month of October, 1903 and 1904.

—	Wheat.		Barley.		Oats.	
	1903.	1904.	1903	1904.	1903.	1904.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	27 1	30 1	22 5	26 2	15 11	16 7
Norwich	26 3	30 4	23 1	25 7	15 0	15 2
Peterborough ...	24 1	30 3	21 10	24 2	14 0	15 4
Lincoln	24 8	30 1	23 5	25 0	15 4	14 11
Doncaster	24 4	29 0	23 6	23 1	15 8	15 3
Salisbury	26 9	29 7	23 5	25 9	17 1	16 6

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of October, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British... ...	13 11	12 1	—	—	—	—	14 10	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	107 0	105 0	108 2	101 0	104 2	99 2	107 7	104 7
Danish ...	119 7	117 7	122 5	118 2	120 5	116 7	120 2	—
Russian ...	95 7	91 7	95 0	88 0	92 5	86 5	94 5	86 5
Australian ...	98 2	95 2	—	—	—	—	108 7	100 0
New Zealand...	97 2	94 5	—	—	—	—	—	—
Canadian ...	100 0	97 2	101 0	96 7	98 5	94 10	102 0	95 0
CHEESE :—								
British Cheddar	65 2	57 0	—	—	66 0	60 0	56 0	52 0
			120 lb.	120 lb.	120 lb.	120 lb.		
,, Cheshire	68 0	64 0	62 7	52 1	63 10	58 0	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	45 2	43 7	45 10	42 5	43 10	42 4	45 7	43 5
BACON :—								
Irish	59 10	55 10	59 10	56 10	60 0	57 10	59 2	56 0
Canadian ...	55 0	50 10	55 7	51 0	53 5	51 5	55 7	51 7
HAMS :—								
Cumberland ...	98 0	88 5	—	—	—	—	—	—
Irish	95 5	80 0	—	—	—	—	94 0	84 0
American ...	49 5	46 5	52 4	48 7	49 7	47 2	51 10	48 2
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	15 7	13 2	—	—	—	—	—	—
Irish	13 6	11 9	10 10	9 7	11 3	10 8	10 1	9 4
Danish ...	12 2	10 9	11 6	9 8	11 6	11 1	11 3	10 0
	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
POTATOES :—	70 6	59 6	51 0	35 0	55 6	47 6	60 0	57 6
HAY :—								
Clover... ...	85 0	74 0	84 0	66 6	82 0	72 0	70 0	65 0
Meadow ...	75 6	66 6	62 0	56 0	57 6	45 0	65 0	60 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

Disease.	October.		10 Months Ended October.	
	1904.	1903.	1904.	1903.
Swine-Fever :—				
Outbreaks	47	85	1,085	1,270
Swine Slaughtered as diseased or exposed to infection ...	182	522	5,035	6,662
Anthrax :—				
Outbreaks	113	46	855	631
Animals attacked	143	60	1,305	947
Glanders (including Farcy) :—				
Outbreaks	135	118	1,333	1,268
Animals attacked	208	228	2,326	2,165
Sheep-Scab :—				
Outbreaks	48	114	1,011	1,232

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

Disease.	October.		10 Months Ended October.	
	1904.	1903.	1904.	1903.
Swine-Fever :—				
Outbreaks	5	11	180	156
Swine Slaughtered as diseased or exposed to infection ...	345	460	4,052	3,597
Anthrax :—				
Outbreaks	—	1	3	3
Animals attacked	—	7	3	10
Glanders (including Farcy) :—				
Outbreaks	1	1	10	3
Animals attacked	1	1	31	4
Rabies (number of cases) :—				
Dogs	—	—	—	2
Sheep-Scab :—				
Outbreaks	*7	*10	*378	*407

* These figures refer to September, and to the periods ending September, respectively.

POST OFFICE SAVINGS BANKS.

SECURITY.—The Post Office Savings Banks are established by Act ot Parliament, and every depositor has the *direct security* of the State for the repayment of his deposits.

DEPOSITS.—Any sum from a shilling upwards, excluding pence, may be deposited at one time, and any number of deposits may be made in the course of a year (ending December 31st) up to a limit of £50. A person may have £200 in all on his deposit account, including interest.

LIFE INSURANCES from £5 to £100 can be granted to persons between fourteen and sixty-five years of age. Children between eight and fourteen years of age can be insured for £5.

OLD AGE PENSIONS.—Provision for old age can be made by buying Savings Bank Deferred Annuities from £1 to £100 to begin at any age selected.

Further information can be had at any Post Office Savings Bank, or on application to the Controller Savings Bank Department, General Post Office, London.

ORDNANCE SURVEY MAPS OF GREAT BRITAIN AND IRELAND.

There are Agents for the sale of Ordnance Survey Maps in most of the chief towns, and maps can be ordered, and indexes, &c., seen at many Head Post Offices in places where there are no Agents. They can also be ordered through any bookseller, or from the Director-General, Ordnance Survey Office, Southampton, or—in the case of Ireland—from the Director-General, Ordnance Survey, Dublin.

THE "BOARD OF TRADE JOURNAL."

The "Board of Trade Journal" is issued every Thursday morning, and single copies may be obtained direct from the publishers, Messrs. Eyre & Spottiswoode, East Harding Street, Fleet Street, E.C., at a cost of 1d., or it may be subscribed for (post free) at the rate of 6s. 6d. per annum for the United Kingdom.

THE "LABOUR GAZETTE."

The "Labour Gazette" is issued on the 15th of each month, and may be obtained direct from the publishers, Messrs. Horace Marshall & Son, Temple House, Temple Avenue, London, E.C., at the rate of 2s. per annum, post free. Copies may also be ordered through any newsagent, price 1d. each.

THE JOURNAL
OF THE
BOARD OF AGRICULTURE.

Vol. XI. No. 9.

DECEMBER, 1904. [NEW SERIES.]

RAILWAY RATES FOR AGRICULTURAL PRODUCE.

The Board of Agriculture and Fisheries think it desirable to give publicity to the following correspondence which has passed between them and the Railway Companies in Great Britain as to the carriage of agricultural produce since the publication of the previous correspondence in this *Journal* in May last (Vol. XI., No. 2):—

I.

The Secretary of the Railway Clearing House to the Board of Agriculture and Fisheries.

Railway Clearing House,
Seymour Street, Euston Square,
London, N.W., July 19th, 1904.

SIR,—With reference to your letter of April 16th last, upon the subject of Agricultural Produce and Requisites by Railway, the further suggestions made by Lord Onslow have been considered by the Railway Companies, in conference, and I am now desired to reply thereto as follows:—

1. *Conveyance of Small Parcels of Farm and Dairy Produce.*

2. *Aggregation of Mixed Consignments.*

These matters shall have further consideration, but the Companies would point out that the circumstances of the different railways, and in different parts of the country vary considerably.

The Companies are not aware of any variation in the practice of charging aggregated consignments of live stock when such consignments are aggregated by senders.

3. *Loss and Damage of Produce Conveyed.*

All the officials concerned in dealing with claims have been fully acquainted with the general policy of the Companies in connection with this matter.

So far as the Companies are aware, every reasonable precaution is taken to ensure milk being sent in cleanly vehicles, and instructions to this effect have been renewed.

4. *Provision of Special Waggons, or Waggons suitable for Particular Classes of Traffic.*

Carriage of Calves by Passenger Train.

I am desired to state that many of the Companies have not, nor have they ever had, any specially-constructed cattle boxes in use, and as regards those Companies which have provided these specially-constructed boxes, whilst having every desire to meet the convenience of senders of cattle, they regret that they do not see their way to incur the great expense which would be entailed in providing an additional number sufficient to meet all requirements on the very few occasions on which they would be needed during each year.

With regard to the conveyance of calves by passenger train, the Department is probably aware that the scale of charges is in proportion to the weight of the animal up to 112 lb., and I have the pleasure to inform you that it has been decided as from September 1st next to extend the arrangement to calves not exceeding 140 lb. in weight, in accordance with the following scale, which will meet all requirements :—

Up to 56 lb. in Weight ...	Ordinary parcels rates.	
Over 56 lb. and not exceeding 140 lb. in weight.	Ordinary parcels rates up to 56 lb., and the excess above 56 lb. at the following scale :—	
	Up to 30 miles	$\frac{1}{8}$d. per lb.
	Up to 50 miles	$\frac{1}{4}$d. per lb.
	Up to 100 miles	$\frac{3}{8}$d. per lb.
	Up to 200 miles	$\frac{1}{2}$d. per lb.
	Above 200 miles	$\frac{5}{8}$d. per lb.

Each calf to be charged for separately. Minimum for each consignment to be as for two dogs.

Yours obediently,

(*Signed*) H. SMART,
Secretary.

The Secretary, Board of Agriculture,
4, Whitehall Place, S.W.

II.

The Board of Agriculture and Fisheries to the Secretary of the Railway Clearing House.

Board of Agriculture and Fisheries,
4, Whitehall Place, S.W.,
August 13th, 1904.

SIR,—I am directed by the President of the Board of Agriculture and Fisheries to advert to your letter of the 19th ult. as to the conveyance of agricultural produce and requisites by railway, and to say that he desires me to offer the following further observations :—

Aggregation of Mixed Consignments of Live Stock.

The information before Lord Onslow goes to show that local officials have in the past held different views on the question whether a truck load of cattle known to belong to different owners but consigned by one person should be charged as a single consignment, or whether the cattle belonging to each owner should be charged separately. In view of Lord Onslow's desire to encourage farmers to aggregate consignments, which he believes is shared by the Railway Companies, he trusts that all doubt on this point has now been removed, and that no extra payment will be required for the carriage of any consignment of cattle for the reason only that it is made up of animals owned by different persons.

Loss and Damage of Produce conveyed.

Lord Onslow is glad to learn that all the officers concerned in dealing with claims have been fully acquainted with the general policy of the Railway Companies in regard to compensation. He feels, however, that having regard to the fact that the work of deciding claims must often be complicated and delicate, it would be desirable that there should be something in the nature of an appeal from the decision of local officers to a higher authority. He would, therefore, be glad to know what opportunity exists for farmers to make such an appeal, and whether a case may be carried either to the Association of Railway Managers, or to the Central Claims Committee, or to any other Association or Committee engaged in railway management.

Lord Onslow desires to express his thanks to the Companies for their issue of renewed instructions as to the conveyance of milk in cleanly vehicles. He trusts that this step will be attended with satisfactory results.

Provision of Special Waggons, or Waggons suitable for particular classes of Traffic.

Lord Onslow fears that some misapprehension has arisen with regard to the communication made under this head. The Board did not intend to suggest that the Companies should forthwith increase the number of special waggons. Their suggestion was that where a consignor has been led to expect that his stock will be conveyed in a special waggon, the Companies should, in the event of any failure to supply such special waggon, supply a horse-box at the same rate as would have been charged for the special waggon (see the reference made to this matter in the Circular Letter No. 108/c, addressed to Railway Companies on September 28th last). Lord Onslow trusts, therefore, that this matter will be further considered.

In this connection I am to say that Lord Onslow is informed that in February last an alteration was made by all the Railway Companies in the system of charging for cattle in horse-boxes, so that where a bull, cow, or ox occupies two stalls, or has the exclusive use of a box, the charge is a single horse rate and a-half. As such an alteration must have the effect of reducing many rates for cattle in horse-boxes, and so of mitigating in some instances the hardship felt by farmers who are disappointed in their expectation of obtaining the use of a horse-box, Lord Onslow would be glad to be informed if his information on this point is correct.

Carriage of Calves by Passenger Train.

Lord Onslow notes with satisfaction the action of the Railway Companies in respect of this matter, and he believes that the modifications in the rates indicated will prove a convenience to consignors.

I am, Sir, your obedient servant,

(*Signed*) WM. SOMERVILLE,

Assistant Secretary

The Secretary,

Railway Clearing House, N.W.

III.

The Secretary of the Railway Clearing House to the Board of Agriculture and Fisheries.

Railway Clearing House,
Seymour Street, Euston Square,
London, N.W., November 8th, 1904.

SIR,—With reference to your letter of August 13th last as to the conveyance of agricultural produce and requisites by railway, &c., the further points raised by Lord Onslow have received the consideration of the Railway Companies, and I am now desired to state as follows :—

Aggregation of Mixed Consignments of Live Stock.

The Railway Companies do not raise any objection to a truck load of cattle, known to belong to different owners, being charged as a single consignment, provided the cattle are consigned by one person to one person, and that the carriage is paid by one individual.

As to the views held by the local officials, the Railway Companies are unaware of any misapprehension on the subject on the part of their local officials, and they do not know of any difficulty having arisen therefrom, but any such mistake would, on being brought to the notice of the Companies, be readily corrected.

Loss and Damage of Produce conveyed.

With reference to the suggestion of Lord Onslow as to an appeal from the decision of local officers to a higher authority, should anyone desire to appeal against a decision, he can bring his case under the notice of the General Manager of the Railway Company interested.

Provision of Special Waggons, or Waggons suitable for particular classes of Traffic.

The Railway Companies were under no misapprehension with regard to the communication under this head, and they are sorry they did not make this clear in their letter of July 19th last.

The Railway Companies regret that they are unable to adopt the suggestion that where a consignor has been led to expect

that his stock will be conveyed in a special waggon, the Companies should, in the event of any failure to supply such special waggon, supply a horse-box at the same rate as would have been charged for the special waggon.

It is correct that reduced charges have been adopted for the conveyance of cattle in horse-boxes, and these charges are as follows:—

	To be Charged.
(1.) If one stall only be occupied.	The single horse rate plus 25 per cent. Minimum, 10s.
(2.) One bull, one cow, or one ox having use of two stalls (no other animal belonging to the same owner being conveyed in the same box) or the exclusive use of a box.	The single horse rate and a-half plus 25 per cent. Minimum, 10s.
(3.) Two bulls, two cows, or two oxen conveyed loose in a horse-box.	As for two horses plus 25 per cent. Minimum, 15s.
(4.) One bull, one cow, or one ox having use of two stalls in a horse-box, together with a second animal (belonging to the same owner), occupying a third stall.	As for two horses plus 25 per cent. Minimum, 15s.
(5.) Three bulls, three cows, or three oxen conveyed in a horse-box.	As for three horses plus 25 per cent. Minimum, 20s.

Fractional parts of 6d. to be reckoned as 6d.

I am, Sir, yours obediently,

(*Signed*) H. SMART,

Secretary.

The Secretary,

Board of Agriculture, S.W.

BRITISH CROPS OF 1904.

The preliminary statement of the produce of crops in Great Britain in 1904 was issued by the Board of Agriculture and Fisheries on November 24th last. The estimated average yields of the cereal, root, potato, and hay crops given therein are summarised in the following table, and compared with the average results of the preceding ten years :—

Crop.	Yield per Acre in 1904.	Difference from Average of 1894–1903.	Crop.	Yield per Acre in 1904.	Difference from Average of 1894–1903.
	Bushels.	Bushels.		Tons.	Tons.
Wheat ...	26·82	– 4·13	Potatoes	6·29	+ 0·54
Barley ...	31·07	– 2·10	Turnips and Swedes	14·36	+ 1·57
Oats ...	39·17	+ 0·11	Mangold	18·76	+ 0·46
Beans ...	23·12	– 5·13		Cwt.	Cwt.
			Hay from clover, &c.	30·11	+ 0·98
Peas ...	25·77	– 0·52	Hay from permanent grass	24·66	+ 1·03
			Hops...	5·91	– 3·21

The yields of wheat, barley, beans, and hops were thus very much below, and those of potatoes, roots, and hay considerably above, the average.

The following table, giving the production of cereals in 1904, shows the total quantity of wheat harvested to be smaller

Crop.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years 1894–1903.
	1904.	1903.	1904.	1903.	
	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
Wheat ...	36,880,246	47,642,816	26·82	30·13	30·95
Barley ...	57,193,067	59,474,041	31·07	32·00	33·17
Oats ...	127,407,848	126,681,188	39·17	39·70	39·06
Beans ...	5,828,175	7,450,330	23·12	31·19	28·25
Peas ...	4,482,866	4,803,123	25·77	26·56	26·29

than that recorded in any year since the produce returns were first collected in 1884. As was noted in the September *Journal,* the area under this crop in 1904 was the smallest ever returned, and the yield per acre has not sufficed to bring the total production up to the 37,176,000 bushels reaped in 1895. It may also be noted that a yield lower than 26·82 bushels per acre over the whole of Great Britain has hitherto only been twice recorded, viz., in 1893, when it was nearly a bushel less, and in 1895.

The shortage in the wheat yield, considerable as it is, was confined to England, there being nearly half a bushel per acre more than the average in Wales; while in Scotland the 38·53 bushels reaped on an acre represented practically a whole bushel more than the mean. In spite of this, however, the quantity grown in Wales and Scotland is relatively so small that the 26·52 bushels noted in England were only raised by less than one-third of a bushel for the whole of Great Britain.

Barley, like wheat, was in 1904 sown on the smallest area on record, and again, like wheat, the total production is the lowest of the twenty years. In only two years (1893 and 1901) was a smaller yield per acre returned. In this cereal also the deficiency occurred in England, which, with 30·47 bushels, was just $2\frac{1}{2}$ bushels below the mean; the Scottish yield being exactly equal to the ten years' mean.

Oats, on the other hand, were satisfactory, the yield being fractionally above the average; only in 1894 and in 1902 has a greater total crop been returned. This result must be largely attributed to the Welsh harvest, which was $1\frac{3}{4}$ bushels over average; England in this case also yielding less than the mean by a quarter of a bushel; and the Scottish yield being practically normal.

Beans were estimated as the worst of the cereal crops in Great Britain as a whole. In England the deficiency from the ten years' mean was nearly $5\frac{1}{2}$ bushels, which represents a reduction per acre of almost 20 per cent. Scotland, on the other hand, had nearly two bushels more than the average, and this crop may rank as the best of the cereals there, although it is of small importance in that country. Peas are negligible outside England, where they were about half a bushel below the average.

It will thus be seen that, as regards cereal crops, the conditions in England and Scotland were materially different. South of the Border all five crops proved deficient, three of them seriously so; north of the Border, on the other hand, none of the five crops were below the mean. In Wales, again, four of the cereals were above the average, beans only falling fractionally below the ten years' mean.

Roots and hay, the details of which are shown in the following table, present a much more satisfactory result. The total production of potatoes has only three times—in 1884, 1895 and

Crop.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years 1894–1903.
	1904.	1903.	1904.	1903.	
	Tons.	Tons.	Tons.	Tons.	Tons.
Potatoes	3,588,254	2,913,713	6·29	5·16	5·75
Turnips and Swedes ...	23,036,129	19,927,460	14·36	12·43	12·79
Mangold	7,481,402	7,187,755	18·76	17·90	18·30
	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
Hay from clover, &c.	69,941,268	73,429,384	30·11	30·44	29·13
Hay from permanent grass...	117,513,916	121,632,062	24·66	25·58	23·63
Hops	282,330	421,068	5·91	8·78	9·12

1901—previously been exceeded. England and Scotland both had an average yield per acre substantially above the mean, but Wales was more unfortunate, farmers there securing only 4·84 tons per acre as against over 6·11 and 7·13 in England and Scotland respectively. An average of 7 tons per acre, moreover, has never previously been noted in any of the three divisions of Great Britain.

The yield of turnips and swedes was heavy, being above the average by more than a ton in England, by 1¾ tons in Wales, and by more than 2½ tons in Scotland, where the record crop of 17¼ tons per acre was returned. Mangold were not so conspicuously good a crop as turnips; nevertheless, they yielded nearly half a ton above the mean. The crop was relatively best in Wales, while upon the very small area in Scotland the results were poor.

The hay crop turned out to be substantially above the average, although it was not up to the level of 1903 either in total amount or yield per acre. Relatively heavier returns were secured in Scotland than in England, while the Welsh returns were also high. Bulking together the hay from rotation grasses, clover, &c., with that from permanent grass, the total production amounted to 187,455,184 cwt.

Hops—grown in England only—fell below the average by no less than 3·21 cwt. per acre. A lower average has only hitherto been returned in the years 1888 and 1890, in which years the total production, on a larger area than that of 1904, differed by only about 1,000 cwt. from this year's total ; the smallest return of all being the 281,291 cwt. of 1888.

TRAINING AND PRUNING FRUIT TREES AND BUSHES.*

As soon as the trees or bushes have been planted they require to be cut back, provided that the weather is not frosty. Some growers prefer to wait until the spring, cutting just before the buds begin to swell. The latter plan is preferable if the planting is done after November, as severe frost occurring immediately after cutting is likely to cause the ends of the shoots to die back below the point of cutting, especially those of plums.

Young apple or plum trees should have their shoots cut back to half or two-thirds of their length, cutting usually closely above a wood bud pointing outwards or otherwise in the direction in which extension is desirable. Pears need less drastic treatment. The reason of cutting back is to adapt the quantity of wood above ground to the dimensions of the roots, always more or less reduced in the process of digging up from the nursery beds, and by the trimming off of broken and bruised portions. Cherry trees usually need to have the interior shoots thinned just when the sap begins to rise in the spring after planting, and the outside shoots cut back about half their length to a bud pointing outwards.

* An article on Planting Fruit Trees and Bushes appeared in the November number of this *Journal*.

The trimming of gooseberry bushes is best left till the spring, just before the buds start, because the more dense their shoots are during the winter, the less facility will birds find for picking off the buds. At the time named, the shoots should be cut back somewhat severely to buds pointing upwards, as nearly all the best fruiting varieties are of a pendulous habit of growth. Inside shoots, where too thick, require to be cut out cleanly, the rule being to leave space enough in all parts of a bush to allow of the hand being passed between the shoots.

Red and white currants require treatment similar to that of gooseberries, the middles being kept well open to sun and air; but only the new wood should be cut back, as the bushes fruit on the old wood. Black currants fruit chiefly on new wood, but must be cut back somewhat severely after planting or before the buds swell in the spring. The bushes of this fruit should not have stems, because the more suckers there are growing straight from the roots the larger and stronger the bushes become. If the bushes are small or weak, the shoots should be cut back to about six inches from the ground, or the stems, where there are any, to buds pointing outwards. But strong bushes, three years old, may be treated in the first season as they should be subsequently. Half the shoots, taking them in alternation, should be cut back to within two or three buds of their bases, the other half being left entire to bear fruit. The result will be the growth of strong young shoots for fruiting in the second season, when the shoots left entire in the first year may be cut back in their turn. By pursuing this plan young shoots growing straight from the roots or stems will be forthcoming annually, and the great evil of young wood growing out of the ends of old shoots, making lanky and weak bushes, will be prevented. When raspberry canes are planted they need to be shortened to nine inches or a foot, in order that they may throw out strong shoots in the following summer.

It is to be observed that the preceding directions, except in the case of the black currant, refer only to cutting back after planting, either immediately, or just when the sap begins to rise in the spring.

With respect to subsequent pruning, it should always be borne in mind that the first object is to train a young tree or bush in

full vigour and desirable shape. First form your tree or bush, and then seek to promote fruiting—this is a motto to be recommended to fruit growers. Weak trees, or any but very strong ones, should not be allowed to fruit at all in the first season after planting, and only small crops should be allowed in the second, or until the trees are growing freely subsequently. Thousands of trees are ruined by premature fruiting, especially those which have been grafted or budded on the paradise stock. Until a tree is well furnished with branches, pruning should be pursued with that object in view, never hesitating to sacrifice some of the possible fruit in order to attain it.

The directions which follow will apply to apple and plum trees, as grown by producers of fruit for market, with plenty of space for extension. In confined spaces, such as small gardens or orchards, where it is desirable to have a goodly number of varieties, necessitating somewhat thick planting, severe shoot-pruning, accompanied by occasional root-pruning, is requisite to keep the trees within their narrow limits, without allowing root growth to overbalance the dimensions of the trees above ground, which would tend towards fruitlessness.

While the general principles of pruning are easy to learn, the details can be mastered only through experience. After a tree has been so trained that it is well furnished with sturdy branches, very little use of the knife will be necessary, except to cut out crowding shoots, leaving all parts of the tree well exposed to sunshine and air, to check any excessive development of one part over another, and to shorten any shoots that may be growing too long and thin. In very windy situations more sacrifice of the extension system essential to the maximum of fruitfulness may be desirable in order to promote sturdiness in the branches and to keep the tops as level as possible, thus greatly diminishing the power of the wind to bang them about. With such qualifications, the extension principle may be followed with advantage after the trees are well furnished with branches.

As a general rule, the main branches of apple and pear trees should be about a foot apart, and those of plums a little less. Some varieties, however, have much denser foliage than others, and those which have most, need the greatest space between the branches to prevent shading. Side shoots, if not needed for

extension where there is plenty of room, should be cut clean off where they are much shaded, but only to within two or three buds of the main branches, where there is plenty of light and air, with the object of inducing the formation of fruit spurs. When such shoots have no buds close to their bases they should be shaved off closely, not leaving any "snags." An exception to such treatment may be made in the case of a shoot four to six inches long with a plump terminal bud, which is a fruit bud, at the end, as this may be left to fruit once, being afterwards cut back as described.

In details of pruning, different varieties, and even individual trees of the same variety, require different treatment. For example, although it is generally desirable to cut the main shoots of a tree to buds pointing outwards, some varieties are of such a sprawling habit of growth that many of their shoots need to be cut to a bud pointing upwards, or even inwards. Again, there is often a deficiency of wood on one side of a tree, and in that case shoots on either side of it require to be cut to buds pointing towards the gap. The Victoria plum is of both sprawling and pendulous habits of growth, while its wood is brittle, and its branches are liable to break when there is a heavy weight of fruit upon them unless they are quite sturdy. Therefore this variety usually requires more severe pruning than other plums, and many of its shoots should be cut to buds pointing upwards.

The cut in pruning, of course, is made from the side of a shoot opposite to that on which the bud grows, outwards or upwards, and care should be taken not to undermine the bud on the one hand, or to leave a snag beyond it. The cut should be close to the bud, but only very slightly slanting.

Care should also be taken to cut back to buds on ripe wood, for otherwise frost may cause the ends of the shoots to die back lower than the place of cutting, and then the next year's shoot or shoots may grow in the wrong direction instead of in that which had been selected. Plum trees are particularly liable to this fault, especially when they are young and are making wood fast. For this reason many experienced pruners prefer to prune when the sap begins to rise in the spring, so that the bud just below the cut may start speedily.

Some varieties of apples fruit largely upon the ends of their shoots. This should be disregarded in pruning until the trees are well furnished with branches of fair length, after which it will need to be considered.

So much judgment in the treatment of different varieties and individual trees is needed that it is difficult to train an ordinary labourer to prune with discretion, and much haphazard work, accordingly, is done in large plantations. Therefore it is better to let one or two pruners of known skill and good judgment do all the work, even if this involves its extension all through the autumn, winter, and the early portion of the spring, than to defer it until the ideal time, just when the sap begins to rise, when more hands will be necessary to get through it before the buds open. A large proportion of autumn, winter, or spring pruning, however, is superseded where summer pruning or pinching is pursued. Unfortunately, this work requires to be done in a market grower's busy season, and for that reason it is not commonly attempted in large plantations. As usually pursued in small orchards, it does not save later work materially, and although it conduces to fruitfulness, through opening the insides of trees to sun and air at a time when the foliage is dense, it is capable of improvement. It consists in pinching off lateral shoots to five or six buds, in order to increase their vigour and to give access to sunshine and air. In the autumn, however, the same shoots have to be cut further back to two or three buds. Moreover, when done as early in the summer as this work usually is, a thicket of spray is likely to form where the shoots have been pinched. But if the work be deferred till August it may be completed in one operation, cutting back to two or three buds. The shoots will then be too tough to be pinched off with the finger and thumb nails. There is no doubt that this treatment conduces to the early development of artificial fruit spurs, at the same time helping that of the naturally formed spurs.

The removal of superfluous main shoots or branches and the pruning of those which require it cannot well be done at the same time as the work just described, or, at any rate, not entirely. In the first place, there will probably be fruit on some of the shoots; and, secondly, the other work needs to be completed as

quickly as possible when not begun before August, and complete pruning would delay it.

In pruning trees that have been stunted by premature fruiting or poverty of soil, it is necessary to cut back their branches somewhat severely, manuring them well at the same time, or early in the spring. It happens sometimes, particularly in cases of weak-growing apples on the paradise stock or pears on the quince, that the branches are profusely studded with fruit spurs and fruit buds, while the trees show no signs of extension. In such cases the only remedy is to cut back to a wood bud, even if the trees are reduced to little more than their stems and a few stumpy branches in the process. Similarly, in relation to plum trees, stunted trees or parts of trees are often to be noticed with masses of mere twigs, often curled in shape, where extending branches should be found. In such cases, again, the only remedy is to cut back to a bud on firm and ripe wood.

Pear trees, after they have once been shaped, require but little cutting beyond the thinning out of crowding shoots. But some varieties of upright habit should have their outside shoots cut back slightly to buds pointing outwards for a few years after planting them.

This is the case also with cherry trees, except that they require thinning alone, as a rule, after the first or second year, as they are naturally of a spreading habit of growth.

Reference has been made to shoots dying off below the point of pruning. These dead snags should be shaved closely off in order that bark may be induced to grow over the cut places. If left, the decay in them will penetrate into the branches to which they are attached.

Damsons, when planted as shelter trees, are often left to grow wild. Unless they are properly pruned for a few years after planting, however, they become thickets, and produce hardly any fruit. They require the same treatment as plums, except that their branches may be allowed to be more thickly disposed.

The pruning of gooseberry bushes after the first season, already referred to, consists chiefly in cutting out dense interior growth, and trimming pendulous shoots back to a bud pointing upwards.

There is a strong difference of opinion as to the advisability of spurring the lateral growths of the main shoots. If this is done, the laterals should be cut back to two or three buds of their bases ; but some of the best growers prefer to shave them off entirely. As the bushes grow old, some of the laterals may be needed in full extension to replace dead or moribund branches.

Red and white currant bushes require a good deal of pruning after sufficient branches of fair length have been formed. In that case it is desirable in June to shorten all side growths not needed to fill up gaps, cutting them further back to within two buds of the main branches in the autumn, when the leaders also must be shortened. Until the bushes are four feet high the shortening of the main shoots may be within six to nine inches of the old wood, according to the length of each in proportion to others ; afterwards to two or three buds. The pruning of black currants has already been described.

Raspberries in field culture are grown without stakes, and, therefore, must not be allowed to grow too high. After the first season the young wood may be shortened to four feet from the ground. This, with the cutting out close to the ground of the last year's canes every autumn, is all the pruning required.

It is important to bear in mind that a good knife, kept thoroughly sharp, should be used for pruning, as jagged cuts do not heal properly, and are liable to lead to canker in apples and pears or gumming in plums and cherries.

This article deals only with trees and bushes grown in plantations for market purposes, and therefore does not cover the training and pruning of cordons, espaliers, or wall fruit.

It may be noted that in the article on Tree Planting in last month's number, the diagonal planting of the trees illustrated in the diagram headed " Trees Angled " can be more clearly seen if the diagram is turned half round.

WILLIAM E. BEAR.

WINTER EGG PRODUCTION.

The production of eggs is an easy matter in spring and summer, when the hen lays naturally, like other birds, but to raise a summer product in the depth of winter is less easy of attainment. There are, however, two reasons why the "egg farmer" should make every effort to secure the production of as great a number of eggs in winter as at other seasons of the year: (1) Because eggs are very much dearer in winter than in summer, and, therefore, the profits for the year will largely depend on the proportion of eggs which the hens can be induced to lay at that season, and (2) because in order to work up a sound business connection with consumers the producer must be in a position to supply his customers' wants all the year round.

To secure a good winter supply of eggs, the following points must be observed: (1) A good winter laying breed must be kept; (2) the hens must be of a highly productive strain and bred, if possible, from several generations of good winter layers; (3) the pullets which are to be kept for winter layers must be hatched neither too early nor too late; (4) the hens must be not more than two years old; (5) the houses, yards, and other appliances must be so laid out and constructed as to ensure comfort; and (6) the food must contain a sufficiently large proportion of those elements which are necessary not only for the formation of eggs, but also to repair waste tissue and to generate the heat of which the cold season tends to deprive the body. Although it is not absolutely necessary that hens which are expected to lay in winter should have a period of rest in summer, yet it may be taken as a general rule that it is a good plan to allow hens to hatch and raise one, two, or three broods of chickens during the season when eggs are cheap. Time lost in this way, if it can be said to be lost, is made up for by the greater number of eggs produced when they are dearest and in greatest demand.

Breed.—There is no single breed which can be said to be the best winter layer, for a breed which will do best in certain circumstances may not be suitable in others. If, however, the different breeds are divided broadly into classes, the weight of

evidence which has been gathered from the experience of practical poultry-keepers and from the laying competitions, points to the conclusion that for winter laying the small non-sitting breeds are excelled by the heavy sitting varieties. The non-sitters will lay a greater number of eggs in the course of the year, but the "general purpose" or sitting breeds are better winter layers. Amongst the most popular of these breeds may be mentioned the Plymouth Rock, Wyandotte, Orpington, Faverolle, and Langshan, and when kept under favourable conditions, fowls of any one of these breeds can be depended upon for a regular supply of winter eggs.

Strain.—The strain of a fowl is of as great importance as the breed, and although this fact is well known to fanciers, who take the greatest pains in building up strains for exhibition purposes, it is unfortunate that practical poultry-keepers in these islands have devoted so little attention to the question of building up strains of specially good layers. The amount of useful work which might be done in this direction, is proved by what has been achieved by the great American egg farmers, who in a very few years have built up strains of hens to lay 200 and even 250 eggs per annum. Experiments which have been made by Prof. G. M. Gowell, of the Maine Experiment Station, with the object of increasing the egg production of hens by breeding from selected layers, show that the average egg yield of hens can be materially increased in four or five years. His experiments, which are still being continued, consist in keeping individual records by the use of "trap-nests" of the laying capabilities of large flocks of hens, selecting the best of these every year and mating them for breeding with cockerels which have been raised in the previous year from pedigree layers. Referring to these experiments, Prof. Gowell says: "The plans on which we are working are based on everyday common-sense. We are simply rejecting the drones, and breeding producers together to secure producers. It is known that the laws of inheritance and transmission are as true with birds as with cattle, sheep, and horses, and when we consider the wonderful changes that have been made in the form, feather, and egg production of hens since their domestication commenced, there is ample room for assuming that a higher average

egg production than the present can be secured by breeding only from those birds that are themselves great producers."

Seasonable Hatching and Rearing.—The farmer who desires to have a supply of winter eggs must raise every year enough pullets to replace a portion of his old stock, and these pullets should be reared neither too early nor too late, but so as to lay at the opening of winter, say the end of October or beginning of November. The exact time at which the pullets ought to be hatched depends very much on the breed which is kept, for there are some, such as the Leghorn, Minorca, Ancona, or Hamburgh, which start laying at about five months, whilst pullets of the larger breeds do not begin until they are seven or eight months old. Pullets of many breeds, when hatched in January or February, commence laying in June or July and moult in October, and are thus spoiled for winter laying, but, on the other hand, if they are hatched too late or if they do not belong to an early maturing breed, they cannot be induced to lay in winter and will only start with the approach of spring.

Age of Hens for Winter Laying. – The most productive period in hens is between the age of six and eighteen months, and many authorities on poultry-keeping hold the opinion that it is best to get rid of laying hens at the age of one and a-half years and to replace them by six-months-old pullets. The majority of poultry-keepers, however, find it more remunerative to keep their hens until they are two and a-half years old, owing to the labour and expense which would be incurred if pullets to replace the entire stock had to be raised every year. The greatest profit is certainly to be made during the first year, when the net earnings of a hen may be estimated at from five to seven shillings, while in the second year they would not amount to more than three or four shillings. In the third year the profits would be very small, for the bulk of the eggs would be laid in spring and summer.

Housing in Winter.—The importance of providing fowls with suitable accommodation cannot be over-estimated, though comparatively few poultry-keepers fully recognise it. The quarters that have served so well during the summer months are not suitable for winter use, but in moving fowls from summer to winter quarters the mistake which is frequently made is to shut

up the fowls too closely in ill-ventilated houses at the approach of hard weather, thus rendering them unhealthy and unfit for laying.

A roosting house for winter use should be substantially built in a well-sheltered location, with a solid foundation, a good dry floor, and walls and roof without cracks or crevices which would admit rain, dampness, or currents of cold air. It should be well lighted and well ventilated and to each bird a space of about ten cubic feet ought to be allowed. Since it is quite as important that the hens should be provided with adequate shelter in the daytime as it is that they should be comfortably housed at night, it is advisable that they should have a large well-lighted open shed in which they may spend the day instead of being forced, as they are on very many farms, to seek shelter on the lee side of a hedge or hay-rick or under cover of a waggon, wheel-barrow, or other farm implement. Hens that mope and crouch and stand on one leg throughout the day are certainly not going to do much towards keeping the egg basket full, and these are habits which they must not be permitted to acquire. On the contrary, they must be induced to take exercise by every possible means, for the great value of exercise as a means of promoting winter laying is well known to practical poultry-keepers. The shelter shed which is provided ought, therefore, also to be converted into a "scratching shed," by keeping the floor well littered with such materials as chaff, mill-dust, loft sweepings, &c., and by burying or raking into this litter a large proportion of the unground corn which is fed to the hens every day. This plan promotes exercise and keeps the hens busy practically all the day. A busy hen is a healthy hen and a regular layer.

Winter Feeding of Laying Hens.—No matter how strong the inherent instinct to lay may be, and it is not very strong in the depth of winter, the hen cannot produce eggs if she is not supplied with suitable food, and the question is what foods or combination of foods can be advantageously and economically fed to promote winter laying? It is certain that the profits will be light if the feeding for winter eggs consists of corn or meals made from corn alone, for these are not sufficiently nitrogenous, and do not supply the proper materials for egg

making unless they are used in combination with foods such as milk, ground bone, clover, and other vegetables. It is believed that the reason why hens lay so well in spring and summer is not because the weather is mild, but because they generally have a free run and access to such foods as grass, clover, weeds, worms, and insects.

For many years past I have been engaged in making experiments with various combinations of food stuffs calculated to promote winter laying, and the method of feeding which has given the best results is as follows : In the morning about nine o'clock, when the fowls have come from the roosting house to the adjoining scratching shed, they are fed with a few handfuls of cracked Indian corn scattered in the litter, and they busy themselves seeking for this until about eleven o'clock, when they are fed a full feed of mash—as much as they will eat up from troughs in half an hour. The mash is made in this way: 30 lb. of finely cut clover hay is steamed and mixed with 20 lb. of barley-meal, 20 lb. of Indian meal, 20 lb. of bran, 10 lb. of cut green bone, and enough skim milk to form the whole into a stiff mash. This is mixed a few hours before it is required for use and is fed warm at the time mentioned. At mid-day a small quantity of wheat is fed in the litter of the scratching shed—not enough to make a meal, but sufficient to keep the birds busily employed until evening, when they are fed with whole grain about an hour before roosting time. It is advisable to feed a variety of grains, not mixed together but one on each evening ; wheat, Indian corn, oats, barley, and sunflower seeds have been found to be good foods for promoting winter laying.

It is not necessary that the manner of feeding described should be accurately followed or that all the foods named should be used, but poultry-keepers should endeavour as far as possible to feed a well-balanced ration consisting of those foods which are necessary for keeping the body in health and in good condition and for the formation of the eggs which the hens are expected to produce.

H. DE COURCY.

TWENTY YEARS' WHEAT IMPORTS.

The cereal year 1903–4 has proved remarkable mainly for the unusually small proportion of our wheat imports furnished by the United States, although that country has not yet relinquished the first place it has held for so many years as a shipper of wheat and flour. In view, however, of the possibility of the loss of this pre-eminence during the present cereal year, it appears desirable to examine the progress of wheat production in those countries upon which we now mainly rely.

In 1883 the acreage under wheat in the United States was estimated by the Department of Agriculture at 36,456,000 acres. In 1903 the same authority puts it at 49,465,000 acres, an increase of about 36 per cent. The yield per acre quoted by the Washington Department would also seem to have increased from 12 bushels per acre on the average of the four years 1881–4 to 13·7 bushels on the average of 1900–1903. During this interval—converting the bushels into cwt. for purposes of comparison—the smallest estimated production has been 185 million cwt. in 1885, and the largest 388 million cwt. in 1901.

With such large variations in the amount produced, the quantities available for export, after the demands of a rapidly-growing population have been met, naturally vary largely; and our total receipts of wheat and flour (in terms of grain) from the United States have ranged from 27,352,000 cwt. in the cereal year 1888–9 to 66,736,000 cwt. in 1900–1, with, on the whole, a general tendency towards an increase.

The United States ship a very large portion of their wheat to this country in the form of flour. This trade does not appear to be liable to quite such large fluctuations as that of the grain itself, although it naturally varies somewhat according to the harvest. The result is that, roughly speaking, the proportion of flour received here from the United States tends to rise when the total exports of grain and flour are small. In no cereal year has this been more conspicuous than in 1903–4, when

we received only 12,897,000 cwt. from the United States in the form of grain, while 17,880,000 cwt. of wheat were required to produce the aggregate weight of the flour we received from that country. The amount of wheat reduced to the form of flour for export to this country has twice previously exceeded the quantity shipped in the form of grain in the past twenty years, viz., in 1887–8 and 1890–1. With a view of ascertaining the whole amount of our indebtedness to the United States for wheat, the following table may be given, shewing the total amount of wheat received from the United States, whether in the form of grain or flour (expressed in each case as grain), distinguishing the proportion in each category :—

TABLE I.—IMPORTS OF WHEAT AND FLOUR (EXPRESSED AS GRAIN) FROM THE UNITED STATES.

Cereal Years.	Amount Imported.	Proportion Received as	
		Grain.	Flour.
	Thousands of Cwt.	Per Cent.	Per Cent.
1884–1885	43,433	60·5	39·5
1885–1886	35,213	59·4	40·6
1886–1887	51,066	62·1	37·9
1887–1888	37,897	48·1	51·9
1888–1889	27,352	52·6	47·4
1889–1890	36,829	51·3	48·7
1890–1891	32,531	48·9	51·1
1891–1892	58,750	57·7	42·3
1892–1893	63,957	59·3	40·7
1893–1894	47,857	52·2	47·8
1894–1895	45,121	55·9	44·1
1895–1896	48,439	59·0	41·0
1896–1897	51,924	61·0	39·0
1897–1898	60,058	61·2	38·8
1898–1899	63,752	59·8	40·2
1899–1900	55,768	56·5	43·5
1900–1901	66,736	58·8	41·2
1901–1902	62,469	66·6	33·4
1902–1903	54,257	59·0	41·0
1903–1904	30,777	41·9	58·1

It is to be observed that the above figures of the amount received from the United States do not represent accurately the amount of wheat of United States origin, for the reason that there is a large cross-trade between that country and Canada. What is precisely the effect of this transit trade it is difficult to

say. The United States and Canadian statistics agree fairly in recognising that something over 2,500,000 cwt. of United States wheat intended for this country passed through the Dominion in the fiscal year (ending 30th June) 1903-4. On the other hand, statistics of the amount of Canadian grain transported through the United States for shipment to this country at Portland or some other Atlantic port—a trade which is particularly carried on during the winter—have been published by the United States Government since 1903. The quantity thus carried in transit to us in the fiscal year 1903-4 is given as 4,789,286 cwt. of wheat, and 349,000 barrels (equivalent to 841,339 cwt. of grain) of flour. So that of the receipts from the United States a net amount of some $2\frac{1}{2}$ or 3 million cwt. should apparently be deducted from the exports of the last cereal year as being of Canadian origin.

Our imports of wheat from Canada have grown largely of late years, more especially since 1896-7, prior to which there had been comparatively little progress. The largest contribution—14,082,000 cwt. (including flour in terms of grain)—was received in the cereal year 1902-3, and that of last year amounted to 12,430,000 cwt.

Statistics relating to the agriculture of the whole Dominion of Canada are only collected in connection with the decennial census. In 1881 the area under wheat was given as 2,342,000 acres (yielding 17,330,000 cwt.); in 1891 as 2,701,000 acres (yielding 22,614,000 cwt.), while in 1901 it was returned as 4,225,000 acres (yielding 29,771,000 cwt.). As regards individual provinces, the chief wheat-growing area is now Manitoba, with, in 1903, 2,443,000 acres, as compared with 209,000 in 1883. The province of Ontario, which had 1,684,000 acres in 1883, has, on the other hand, in common with the East of Canada generally, steadily decreased its wheat production, and now has but 914,000 acres. This province bids fair to be shortly overtaken by the North-West Territories, which, in 1903, had 841,000 acres under wheat, against only 308,000 five years previously.

The chief competitor with the United States in shipments of wheat to Great Britain has been, as a general rule, Russia; although this country is an uncertain source of supply. Nor

can it be said that, on the whole, it has of late years shewn any continuous tendency to increase its exports, at least to the United Kingdom. The largest quantities we have received thence have been 24 million cwt. in 1888–9, and 23 million cwt. in 1894–5; while the 19 millions received in 1903–4 was no greater than the quantity received in 1889-90. On the other hand, poor harvests have resulted in our receiving less than 4 million cwt. in 1886–7, and in each of the four consecutive years 1898-9 to 1901–2. On three occasions during the past twenty years Russia surpassed the United States as a contributor of wheat in the form of grain alone; a circumstance which occurred again in 1903–4, when, however, Russia was herself surpassed by India.

The official Russian statistics suggest a large growth of the wheat areas. An enquiry in 1881 put the wheat area in European Russia (excluding Poland) at 28,947,000 acres; while in 1903 it is given as 43,755,000 acres. To this must be added the area in Poland, the Caucasus, Siberia, and the Asiatic Steppes, which together had 13,518,000 acres under wheat in 1903. The estimated production amounted in 1884 to 138,515,000 cwt. in Russia proper only, and to 242,774,000 cwt. (in the same territory) in 1903. In connection with the small growth of Russian exports to the United Kingdom, the effect of the growing demands of Russia's nearest neighbour—Germany—must not be overlooked.

The third country which during the period under review has contributed most to our supplies is India. This great Dependency, owing to its climate, is at times subjected to severe fluctuations in its production which are naturally to a great extent reflected in its exports to this country, although it does not always follow that a yield above the normal will invariably result in a large exportation. The consumption of wheat in India appears, in fact, to be unusually susceptible to the variations in the price that may be obtained by exporting it to other countries. This is brought out by the following table, which shews the area, production, and exports of wheat from India during the past fifteen years. For the purpose of this table, the financial years ending March 31st, which may also be looked upon as the Indian "export" years, have been

taken; and the British Gazette price in the calendar years 1889–1903 has been added for comparison:—

TABLE II.—AREA, PRODUCTION, AND EXPORT OF WHEAT IN INDIA, AND GAZETTE PRICE OF BRITISH WHEAT.

Years ending 31st March.	Area.	Production.	Exports in Following Year.		British Gazette Price of Wheat per Quarter.
			Total.	To United Kingdom.	
	Thousands of Acres.	Thousands of Cwt.	Thousands of Cwt.	Thousands of Cwt.	s. d.
1889–1890	24,773	122,460	14,320	9,271	31 11
1890–1891	26,576	137,520	30,307	13,866	37 0
1891–1892	24,482	110,700	14,973	9,926	30 3
1892–1893	26,429	143,860	12,157	7,429	26 4
1893–1894	26,778	135,420	6,890	5,088	22 10
1894–1895	25,994	125,586	10,004	7,736	23 1
1895–1896	23,242	110,219	1,911	1,506	26 2
1896–1897	19,024	97,857	2,393	1,079	30 2
1897–1898	22,954	133,735	19,520	10,674	34 0
1898–1899	23,923	126,792	9,704	6,549	25 8
1899–1900	17,183	97,394	50	7	26 11
1900–1901	22,922	135,314	7,322	4,879	26 9
1901–1902	23,447	121,270	10,292	8,894	28 1
1902–1903	23,092	155,322	25,911	19,733	26 9
1903–1904	27,773	187,750	—	—	—

There are in this table three years in which the exports were unusually heavy, viz., the financial years 1890–1, 1897–8, and 1902–3. In the first two of these years the price of wheat in Europe, owing mainly to shortages in the Russian or American crop of the previous season, was much above the average, and the Indian production was little more than normal, while in 1902–3 the Gazette price was under the average of the period and the Indian production was exceptionally heavy. Apart from the last two years, the largest harvest was in 1892–3; but owing to the low value then current, India apparently preferred to consume more of it at home. The smallest exports, on the other hand, were in 1895–6, 1896–7, and 1899–1900, all corresponding to years of very low production; the price in 1896–7 was, it is true, comparatively high, but there was clearly no wheat available for export. In another year, 1891–2, the preceding harvest had also been poor, but the price was sufficiently high to draw out an export above the average. It may, therefore, safely be concluded that the price

which Europe is willing to pay is a very important factor in regulating the external trade of India, and that as much weight should be given to the values current as to the amount of the crop in forming any anticipations of the probable exports from that country.

Considering now the British cereal year, it may be remarked that 1903-4 is the first occasion on which India, with over 23 million cwt., has occupied the foremost place among the countries supplying us with wheat in grain, although it has not yet exceeded the amount of wheat and flour together from the United States.

Argentina has, during the past five years, sent us more wheat on the average than any other country except the United States. But it is only in comparatively recent years that it has come to the front, and the extension of its wheat area has been more rapid than in any of the other important territories contributing to our supplies of breadstuffs, while it is also probably capable of still further increasing this area more rapidly than other countries. Statistics for early years are mostly wanting, but official enquiries return the wheat area at 271,000 acres in 1875, 601,000 in 1883, 2,014,000 in 1888, 5,063,000 in 1895, and 8,348,000 in 1900-1, while the latest returns—for 1903-4—shew 9,271,000 acres. The progress of the export trade has been equally rapid. It is only from 1891-2 that the imports of wheat from Argentina can be given for our cereal year, they having previously been grouped with "other countries" in the monthly trade returns. In that year, however, we received 2,692,000 cwt. Imports rapidly increased until they reached 14,106,000 cwt. in 1894-5, then dwindled and rose again to a maximum of 18,116,000 in 1899-1900; and, after a further fall to under 5,000,000 cwt. in 1901-2, recovered to 17,490,000 cwt. in 1903-4.

Two other sources of wheat, upon occasion, rise to considerable importance. These are Roumania and Australasia. Both are subject to climatic conditions that render them very unreliable sources of supply. Our imports from the former frequently follow the movements of the Russian trade, though there are certain notable exceptions. The largest quantities received from Roumania have been 4,301,000 cwt. in 1890-1 and 4,536,000 in 1896-7; on the other hand, not a single cwt. was received thence

in the season 1899–1900. Australasia, while capable of yielding much more than Roumania in good years, sent us absolutely nothing in 1896–7. Perhaps the most interesting example of wide fluctuations according to the season is to be found in the last three years. In 1901–2 we received from Australasia 6,799,000 cwt. (the maximum), in 1902–3 only 91,000 cwt. (the lowest but one), while in 1903–4 we had 6,570,000 cwt. (the highest after 1901–2).

It may be mentioned that we have occasionally received as much as a million cwt. from Germany, Turkey, Bulgaria, and, in earlier years, Chili.

The foregoing statements may conveniently be summed up in Table III., showing the proportions of our wheat supplies received from the principal countries during the past twenty years. The figures refer to grain and flour together. The importation of flour from Russia, India, Argentina, Roumania, and Australasia has been ignored: the amounts received thence will not affect the percentages, except that the flour from Argentina (now amounting to 100,000 cwt. or rather more annually) would raise that country's quota by a decimal point in certain years.

TABLE III.—PERCENTAGE OF WHEAT (GRAIN AND FLOUR EXPRESSED AS GRAIN) IMPORTED INTO THE UNITED KINGDOM FROM CERTAIN COUNTRIES TO TOTAL IMPORTS.

Cereal Years.	United States.	Canada.	Russia.	India.	Argentina	Other Countries.	Total.
1884–1885	53·3	3·0	11·8	12·3	—	19·6	100
1885–1886	50·9	4·1	10·1	17·6	—	17·3	100
1886–1887	64·9	6·6	3·9	13·6	—	11·0	100
1887–1888	49·8	4·6	20·0	8·2	—	17·4	100
1888–1889	33·7	2·4	29·8	11·9	—	22·2	100
1889–1890	45·1	3·4	23·3	11·6	—	16·6	100
1890–1891	40·0	4·5	19·8	13·4	—	22·3	100
1891–1892	59·2	5·2	6·4	15·8	2·7	10·7	100
1892–1893	66·1	5·7	8·4	5·8	6·2	7·8	100
1893–1894	49·8	4·6	17·2	6·6	12·2	9·6	100
1894–1895	42·3	4·3	21·5	7·1	13·2	11·6	100
1895–1896	50·2	6·4	18·9	5·0	6·3	13·2	100
1896–1897	55·9	6·3	16·6	·5	1·4	19·3	100
1897–1898	63·9	7·4	10·4	8·5	4·2	5·6	100
1898–1899	64·5	9·9	3·3	8·8	7·4	6·1	100
1899–1900	58·7	9·1	3·0	1·6	19·1	8·5	100
1900–1901	64·4	7·9	3 6	1·3	11·1	11·7	100
1901–1902	61·7	10·7	3·0	7·3	4·9	12·4	100
1902–1903	48·6	12·6	12·3	10·7	10·6	5·2	100
1903–1904	25·7	10·4	16·1	19·3	14·6	13·9	100

As regards our supplies during the current cereal year, 1904–5, the chief feature is the anticipated inability of the United States to furnish more than a relatively small proportion. The official United States *Crop Reporter* in May last put the area under winter wheat at about 27,083,500 acres, and the spring wheat area was returned in June at 17,141,000 acres, or 44,224,500 acres altogether. This is considerably below the area of 1903. Official figures regarding the yield have only been partially given. In August the amount of winter wheat was estimated as 173,000,000 cwt., and in October the yield of spring wheat was returned at 12·7 bushels per acre, both these figures being, of course, provisional. These estimates would indicate a total production of some 286,000,000 cwt., provided no change be supposed to have occurred since the dates at which the different data were published. This amount is very considerably below that of recent years, and, in fact, many persons in the trade seem to think that the production may be even less. As regards probable exports, no official data naturally exist; but trade forecasts, such as those of the *Corn Trade News*, are current of a probable export from the United States of some 25,000,000 cwt. during the present cereal year, some portion of which will, doubtless, be taken by other countries.

As the United Kingdom now requires well over 100 million cwt. annually, it seems clear that we can look to the United States for only a comparatively small proportion. India had (last March) a very bountiful harvest, and can do much to help the deficiency, but a large part of its surplus has already been shipped, and the same may be said of Argentina. Much therefore depends on what these two countries may produce next harvest. So far they promise well; but this remark, in the case of India, can be taken to mean little more than that sowings have been completed under favourable conditions. The Argentine crop is now near maturity, and an export of upwards of 50 million cwt. has been suggested as probable. The harvest in Canada is not thought to be nearly so short as in the United States, so that exports on as large a scale as in recent years may be available. Apart from these two countries, Russia may be expected to supply the larger proportion of our requirements. A recent telegraphic summary states that

the Central Statistical Committee at St. Petersburg have estimated the total wheat production of the seventy-two Governments in 1904 at 82,818,000 qrs., or 355,000,000 cwt. This is considerably more than last year, and also much over an average crop. It may be anticipated, therefore, that during the season 1904–5 the bulk of the wheat consumed in the United Kingdom will be of Russian, Argentine, and Indian origin.

Cereal Production in Greece.

Greece at the present time imports cereals to the value of nearly £1,500,000 per annum, but there is a good reason to suppose that, with a better supply of labour and better agricultural methods, Greece could supply itself with all the grain required for home consumption. It is not easy to arrive at a trustworthy estimate of the country's total production of corn, but the following figures, which represent the only recent compilation of the kind from official sources, have been supplied to the British Delegate on the International Financial Commission at Athens by an official of the Ministry of the Interior. Without placing too great reliance on the accuracy of these figures, it is permissible to accept them in their broad lines :—

Cereals.	Yield in 1900–01.		
	Thessaly.	Other Provinces.	Total.
	Bushels.	Bushels.	Bushels.
Wheat	2,276,798	4,557,659	6,834,457
Meslin and Wheat and Barley	229 490	1,199,560	1,429,050
Barley	789,812	2,161,801	2,951,613
Rye	54,730	41,283	96,013
Maize	925,299	3,399,337	4,324,636
Oats	149,029	708,772	857,801

According to this table in the season 1900–01, which produced a very indifferent harvest, the total production of wheat, meslin, and of wheat and barley mixed, was 8,263,507 bushels ; the normal annual import of wheat during the last few years of poor harvests (excluding 1903), has been about 6,000,000

bushels. It would appear from this that the total annual consumption of Greece (the amount exported being a negligible quantity) is about 14,000,000 bushels, which, for a population of 2,600,000 souls, would give an annual consumption of 5·4 bushels per head of population—a not improbable result.

The wheat as distinct from the meslin included in the above total of 8,263,507 bushels, amounts to 6,834,457 bushels. This quantity was obtained from 1,429,691 bushels of seed, giving a yield of rather less than fivefold. The yield of cereals is habitually reckoned in this manner. Taking $2\frac{1}{3}$ bushels as the average sown per acre, fivefold gives a yield per acre of about 12 bushels; sevenfold, 16 bushels; eightfold, 19 bushels. But in a good year such as 1903 the harvest yields sevenfold the seed sown (in Thessaly eightfold), and as the amount sown varies little, it may be inferred that in a good year Greece produces 10,000,000 bushels of wheat, besides about 1,500,000 bushels of meslin and wheat and barley mixed, out of a total consumption of 14,000,000 bushels. The present quality of Greek wheat is not altogether satisfactory, as it yields a larger proportion of bran and a less proportion of flour than Russian wheat, and the plentiful harvest of 1903 did not, in consequence, sell very readily.

[*Foreign Office Report, Annual Series, No.* 3,302, *Price* $2\frac{1}{2}$*d.*]

Use of Macaroni Wheat for Bread-making.

Since the introduction of the macaroni or "durum" wheat into the United States, to which reference has been made in this *Journal* (July, 1904, p. 208), investigations have been carried on by the United States Department of Agriculture into the purposes for which wheat of this class could be used in addition to the manufacture of macaroni. It was known that bread was made from it both in France and Russia, and in 1902, when a comparatively large amount of durum wheat was harvested in America, much of the flour was employed more or less experimentally for making bread. In 1903 a complete series of experiments on a comparatively large

scale were undertaken by the Department of Agriculture in the use of durum wheat-flour for bread.

The results of the comparison, both by chemical and baking tests, with good hard spring and winter wheat, showed that there is often very little difference in quality between the flours, and that on an average the durum wheat-flour makes as good bread as the other flours. The strongest objection is to its colour, which is a little more yellow or creamy than flour from the best hard spring wheat, but it is stated that when mixed by modern processes it will make bread entirely satisfactory in colour. It would seem, therefore, that in addition to its employment for macaroni, the flour can be used for bread-making or for blending with other kinds of bread-flour, and an extension in its cultivation may be looked for, more particularly in those semi-arid regions of the United States to which its drought-resisting qualities make it specially suitable.

Protection of Seed against Crows.

The employment of coal tar for the protection of seed against the depredations of crows is practised in some parts of Great Britain and the Continent. In some investigations carried out at the Neuburg Agricultural School, to which reference has been made in this *Journal*,* good results were obtained by the treatment of seed wheat with a solution of 2½ oz. coal tar, 2½ oz. petroleum, mixed with one quart of water, per bushel of seed.

A somewhat similar mode of treatment is described† by M. Schribaux, Professor at the *Institut National Agronomique*, as being practised on a large farm in the Department of Oise. The wheat thus treated showed no trace of destruction by crows, although serious damage had been caused to neighbouring fields, notwithstanding the fact that the latter had been watched uninterruptedly. Similar successful results had been obtained in preceding years.

The solution was made as follows :—11½ pints of coal tar, 5¾ pints of petroleum, 1 1/12 pints of carbolic acid, to 5 qrs. (of 480 lb.) of seed.

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* *Journal*, Vol. IV., p. 246, Sept., 1897. † *Journal d'Agric. Pratique*, 1899.

The proportions named should be strictly adhered to in order to obtain successful results. Commercial carbolic acid of full strength must be used. The mixture should be made as follows: Place the coal tar in a pot on a slow fire until it is quite hot and shows signs of boiling, remove it from the fire and add the petroleum while stirring, and finally the carbolic acid. The mixture should be thoroughly well stirred, and it will remain quite liquid after cooling.

In order to treat the grain, about 4 bushels of seed should be spread out on a water-tight floor, and a tenth part of the mixture, which will be a little less than two pints, poured on it. This must then be stirred up quickly till each grain is blackened and the whole is about the colour of roasted coffee. Continue in the same way, dealing with about 4 bushels at a time.

The seed cannot, however, be sown in this condition, as it would stick to the cups of the drill, and in order to remedy this add to each 4 bushels of seed about 2 pints of phosphate of lime. When mixed, the grain will be completely dry, and can be sown in the ordinary way. Seed treated in this way will not be touched by crows, though the growth may be retarded by some two or three days. The cost per bushel would be insignificant.

Importance of Pollination in Hop Growing.

In some experiments carried out at the South-Eastern Agricultural College, Wye, in connection with the production of new varieties of hops by cross-fertilisation, it was found that the young hops which were not pollinated, and which served as check experiments or controls, always remained in burr for a much longer period (often more than a week) than those which were pollinated. The non-pollinated hops never recovered their lost ground, but turned out at picking time to be small, green, and unripe, and compared very unfavourably with the well-grown, golden yellow and ripe pollinated hops. The difference between the two sets was so great in all respects that they would never have been taken for hops of one variety, much less for hops growing on the same bine and on opposite pairs of laterals.

A further point of some interest was noted when the experimental hops were picked. It was found that the controls, which in all cases turned out to be seedless, were attacked by mould to a much greater extent than the seed hops which had been pollinated. Indeed, these latter were singularly free from this parasite. Fertilisation, therefore, seemed not only to stimulate the growth, to hasten ripening, and to improve the colour, but also to increase the mould-resisting power of the hop itself.

The behaviour of the experimental hops suggested the desirability of extended observations in hop gardens to determine, if possible, whether the above results, arrived at under somewhat artificial conditions, were borne out in actual practice. In the first place, a very large number of nearly ripe hops were examined in order to determine to what extent seed-production takes place. No well grown-out hops were seen without seeds. A considerable period elapses between the beginning and end of pollination in any particular hop, and in view of the scarcity of males in many gardens, it appeared probable that hops would be found seedless at the base, fertile at the free end, and *vice versâ*. A search showed that this was the case, and it was noticed that fully-developed seed hops and badly grown-out, unripe, seedless hops were often to be found on the same bine. In such cases pollen was probably abundant when the earliest hops on the bine were in burr, but was not available when the later hops were ready for pollination. Hence, in order to obtain all the hops on a bine in a well grown-out condition, pollen must be available during the whole burr period.

The above experiments and observations all point to the necessity of fertilisation in the production of well-grown hops of the desired colour, and Mr. Albert Howard, the Botanist of Wye College, by whom the experiments have been carried out, observes that it seems difficult to escape the conclusion that under the conditions obtaining in Kent the growth of seed hops rather than seedless hops should be aimed at. Before, however, any special recommendations are made on such an important subject as this, it is proposed to carry out further investigations during the coming season.

Insurance of Cattle in France.*

The system of co-operative insurance against losses through death or compulsory slaughter of cattle has gained ground in France within the last few years, largely in consequence of the efforts of the French Department of Agriculture to foster and encourage its development. Until 1898 no assistance was afforded by the State to these mutual insurance societies, but since then a sum of about £20,000 has been annually included in the Agricultural Budget, out of which sums, usually about £20, have been granted to new societies in order to cover the expenses of formation and to give them a few pounds in hand. Recently, in consequence of the number of applications, the grant has had to be reduced to £12, but it is proposed to increase the amount of the vote in future years.

In order to facilitate the formation of these associations, some legal difficulties as to their constitution were removed by a law passed in 1900, and they were also exempted from stamp and registration dues; while in 1902 the Minister of Agriculture, in a circular letter to the Departmental Professors of Agriculture, urged upon them the importance of doing everything in their power to promote the establishment of societies of this character, and they were directed to make a Quarterly Report on the steps which they had been able to take with this object. As a result it appears from a Report by the Minister, dated 2nd November last, that the insurance societies, which at the end of 1897 numbered 1,484, had increased to 4,820, of which 4,719 were for the insurance of cattle, and the remainder for insurance against hail, fire and accidents. The capital insured was rather over £10,000,000 and the number of members 265,015, giving an average of 55 members to each society and an average insurance of £38 to each member. The size of these societies, it will be seen, is very small, but this is largely due to the fact that it is considered desirable that their operations should be restricted as a rule to a single commune, experience having shown that small societies are likely to be most successful, as they allow members

* Notes have appeared in previous numbers of this *Journal* respecting the insurance of live stock: in Belgium, Vol. VI., June, 1899, p. 25; Vol. IX., June, 1902, p. 36; and in Bavaria, Vol. IX., June, 1902, p. 60; and Vol. XI., April, 1904, p. 26.

to see that claims for compensation are not improperly made and to keep the management entirely in their own hands.

The organisation of these societies varies in different districts. In some cases, instead of the payment by each member of a fixed premium dependent on the capital value insured, the amount of the losses is shared amongst the members quarterly or half-yearly, the whole business of payment of losses and collection of subscriptions being transacted at one meeting. The French Minister of Agriculture points out that this method has the advantage of being easily understood by persons not well acquainted with co-operative methods, and tends to remove those feelings of distrust which are sometimes found in centres not yet accustomed to insurance or co-operation. Many societies, again, are affiliated to some central union which guarantees the payments should they, as in the event of an outbreak of disease, exceed the resources of the society. For example, in the case of the insurance societies in the Department of La Sarthe, the indemnity for losses is fixed at 70 per cent., and this is shared in proportion to the value insured among the members; if, however, the total compensation should exceed an amount equal to a premium of 1 per cent., the balance is defrayed by the Central Union, towards the funds of which a contribution is made of 1s. for every £100 insured; this union was established under the auspices of the *Syndicat des Agriculteurs de la Sarthe*, who made a grant for that purpose of £800 out of their reserve funds.

Another type of society, largely adopted, is that requiring the payment of a fixed annual premium. The members of these associations pay an entrance fee of 10d. per animal insured, but this is frequently reduced to 5d. in the first year of the society's existence. The annual premium is 1 per cent. of the value of the cattle insured, paid quarterly or half-yearly, but if this is insufficient to meet the demands it may be raised to 2 per cent. before drawing on the reserve funds. On the other hand, under favourable circumstances the premium may be reduced. Compensation is paid for losses at the rate of 80 per cent., or four-fifths of the value, less any sums received for the flesh, hide, &c. of the dead animal; or, in the case of compulsory slaughter, less any compensation obtained. No compensation is paid for deaths

of animals under 3 months old, or of cows over 12 years, for losses by robbery, floods, fire, &c., or for losses due to overwork, lack of care, ill-treatment, &c.

The need for uniting these small associations into federations in order to enable them to meet exceptional demands is especially urged by the Ministry of Agriculture, and there are at the present time seventeen societies for re-insurance.

Utilisation of Cider Apples for Cattle Feeding.

In Mr. F. J. Lloyd's Report on Cider Making*, reference is made to the utilisation of the pomace or refuse of the apples after they have been pressed, and it is noted that the expressed pomace may be used for feeding animals and is a good food so long as it can be given to them while still fresh; but it undergoes rapid change and is then said to be injurious. This observation may be supplemented by an account of the employment of this substance in France, which appeared in a recent number of the *Journal d'Agriculture Pratique*. The pomace resembles in some respects the sugar beet pulp largely used on the Continent as a cattle food. It should preferably be cooked by exposure to steam before being fed, and the quantity given should not exceed 26½ lb. per head daily for cattle weighing 900–1,100 lb. live weight ; for sheep and pigs about 4½ to 6½ lb. are enough. It should be given with dry food, such as chopped hay or straw, or cake, as the proportion of water it contains is high, while its nitrogenous constituents are low. This will be seen from the following analysis made by Mr. F. J. Lloyd of the pressed pomace as taken from the press :—

COMPOSITION OF PRESSED APPLE POMACE.

Water	72·40
Oil	1·08
Nitrogenous constituents	1·27
Sugar, &c.	18·34
Woody fibre	4·64
Mineral matter	2·27
	100·00

* *Cd.*. 1868. *Price* 8*d.* *p.* 41.

As has been said, the pomace rapidly changes by exposure to air and becomes injurious for feeding purposes. The best way to preserve it when in large quantities is by a system of ensilage —that is, storing it in clamps or pits. Salt should be sprinkled over it in a proportion of 2–3 per cent., and the silo covered with a layer of straw and then by a thick layer of earth. Pomace treated in this way furnishes a food richer weight for weight than fresh pulp, and has been employed very successfully in Normandy. The fermentation which takes place in the silo effects certain changes in its composition, and the proportion of water is reduced while the nitrogenous and fatty matters are increased. On one farm, before storing, the residue obtained from the cider press received an addition of 4½ lb. of salt and of 112 lb. of chaff per ton of residue, and after storing in the silo for 40 to 50 days, the silage thus obtained was used for feeding to cattle in conjunction with other foods as follows:—(1) for draught cattle, 22 lb. of silage, 4½ lb. of oat or wheat chaff, 1 lb. of decorticated cotton-cake; (2) for store cattle, 17½ lb. of silage, 4½ lb. of chaff, 11 lb. of cooked potatoes, 2 lb. of cake; (3) for fat cattle, 11 lb. of silage, 6½ lb. of hay, 11 lb. of cooked potatoes, 11 lb. of roots, and 3⅓ to 4½ lb. of cake.

The use of raw apples as a food for cattle is also recommended in the article before referred to, particularly in view of the scarcity of hay combined with the abundance of apples prevailing in some parts of France. It is pointed out that where the crop of cider apples is greater than can be profitably or conveniently dealt with, the surplus may be usefully employed in this way.

The proportion of water in the composition of the apple is high, and in order to make a suitable food they require to be mixed with dry fodder, chopped straw, chaff, or bran. They should be cut into slices with a root cutter, in order to prevent their being swallowed whole. The quantity given to cattle should not exceed 26–33 lb. daily per head. Cooking the apples is recommended, as it takes away the acidity of the fruit and is said to give excellent results both for fattening and for milk production.

The Sheep Maggot Fly.

The Green-bottle Flies (*Lucilia*) and the Blue-bottle Flies (*Calliphora*) are two genera belonging to the *Muscidæ*, an important family of the two-winged flies. One of the Green-bottle Flies (*Lucilia sericata*), is a very prevalent cause of maggots on sheep, the maggot-infested animals showing the following characteristics—matting together of the wool fibres a continual wagging of the tail; rubbing and biting by the sheep in their efforts to allay the irritation caused by the feeding maggots; much inflammation; the oozing from the sores of an evil-smelling sticky fluid; discolouration of the wool

THE SHEEP MAGGOT FLY. *Lucilia Sericata.*

Fly, Twice Magnified.

Pupa Case, Showing Place of Exit of Fly.

Maggot, Magnified.

which falls out and in bad cases does not grow again; emaciation of the sheep, especially lambs.

Description of Lucilia in its different stages.

Lucilia sericata is a bright shining green or blue-green fly measuring about one-third of an inch long and about seven-eighths of an inch in spread of wing. The fly, examined with a lens, is seen to be covered with dark bristles, and the arrangement of these bristles is used as an aid in distinguishing this and allied species.

The eggs are yellowish-white, and measure about one-sixteenth of an inch in length.

The larva is a legless maggot, capable, however, of an active crawling movement. It measures when full grown from a quarter

to one-half of an inch in length ; the head end is pointed and provided with two mouth hooks ; the hind end is blunt with tubercles round its margin, and two plates carrying the spiracles on its flat surface. Examination of the first segment behind the head with a good lens would show the spiracle to be fan-shaped and with ten little prominences. Professor Carpenter points out that a blue-bottle maggot would show in the same situation thirteen such prominences.

The pupa cases are brown and rounded or barrel-shaped, and the fly when ready issues by a hole at one end.

Life History.

The female fly is capable of laying as many as 500 eggs, and fixes these in clusters of twenty and more to the wool. These eggs may hatch in favourable conditions in twenty-four hours, and the maggots feeding at first externally, later bore into the flesh. By a fortnight they may be full grown, when they drop away from the sheep and become pupæ under cover of the barrel-shaped case. It was found by experiment that the flies issued in from less than a fortnight to over a fortnight, according to temperature and other conditions.

The attack is worse on lambs than on old sheep, and the flies are found at work from May onwards till the autumn. Moist, warm, muggy weather, and warm sunshine after showers favour the fly.

Loss.

Direct loss from death is not likely where careful oversight by the shepherds is possible, such loss being most likely in hill pastures. Indirect loss is heavy from the disturbance to the flock by the continual hunting and collecting. "Struck" sheep also thrive badly and are depreciated in value partly from this and partly from disfiguration.

Preventive and Remedial Measures.

1. Cleanliness. Sheep should be kept thoroughly clean about their hindquarters. A good preventive is to clip the wool of the tail and between the hind legs, docking the tails of sheep when too long. The purpose is to clear away any filth and to leave as little chance as possible for lodgment, for the flies have a keen sense of smell and are attracted to dirty places

for their egg laying. Hence it is that sheep suffering from diarrhœa fall such easy prey to the fly.

2. The burying or burning of all carcases of dead animals, including birds, so that these may not serve as breeding places for the fly.

3. Dipping. As a preventive measure dipping is useful, but immunity does not last for very long, hence the dipping must be repeated. Sulphur is a useful ingredient in any such treatment, the odour keeping away the fly.

4. Dressing the neighbourhood of wounds with some deterrent dressing, *e.g.*, an ointment of butter and flowers of sulphur; or spirits of tar.

5. As a remedial measure the infested sheep should be isolated.

6. The maggots are not difficult to kill. Where seen they should be picked off, or where they have got to work let the wool be shorn a little and the parts dressed with turpentine and rape oil in equal parts, or carbolic acid or benzine may be sprayed over the places.

Foot-Rot Experiments.

At various times during past years the Board of Agriculture have had their attention directed to the loss and inconvenience caused to flockmasters by foot-rot in sheep. Careful individual treatment of the hoof has long been recognised as the surest way to effect a cure, but where a large number of animals have to be dressed much time and labour are involved, and the due performance of the operation is apt to be neglected. Of recent years attention has been directed to the advantages of treatment by means of a foot-bath, into which a suitable solution is placed, and through which the sheep are walked. In order thoroughly to test this method of treatment the Board have obtained a number of baths and a supply of copper sulphate (bluestone), and these have been placed on selected farms in various parts of Great Britain where the disease is prevalent. It is hoped that in this way definite information of service to sheep-farmers will be obtained.

Importation of British Hams into France.

During the past summer several shipments of English and Irish hams were stopped by the Customs officials on entry into France, on the ground that the goods were falsely declared as of British origin, and that they were in reality American or Canadian hams. The difficulty has arisen owing to the fact that hams and bacon of British origin may be imported into France under the minimum tariff at the rate of 12s. 2d. per cwt., whereas Canadian and American hams are required to pay 20s. 4d. under the maximum tariff; in the case of hams coming through England there is an additional charge of 1s. 6d., so that the excess charge on Canadian hams imported in this way as compared with English hams is 9s. 8d. per cwt. The Customs authorities in France assert that, in order to avoid paying the higher rate of duty, large quantities of American and Canadian hams are imported under the name of British. In several instances, however, hams undoubtedly of English origin were declared by the French experts to be Canadian, and representations on the subject were made to the Foreign Office. The Board have now been informed that in consequence of the communications which have recently passed between His Majesty's Embassy and the competent French authorities, it is hoped that in future there will be no difficulty with regard to the importation of British hams whose origin is properly certified by documents legalised in the usual manner.

Cheap Milk Tests for Farmers.

In response to representations from the Board of Agriculture, most of the agricultural colleges in England are now prepared for a small fee, usually 6d., to determine the fat-contents of milk for local farmers. It should, therefore, be possible for dairy farmers, by means of carefully-selected samples, to watch closely the seasonal and other fluctuations in the character of their milk, and to take steps to maintain the quality at a satisfactory level. Regular periodic analysis of the produce of individual cows should also lead to the elimination of unsatisfactory animals, and to the use for breeding purposes of the best members of the

herd. In this way a herd will be submitted to a process of grading-up, which cannot fail to react on the quantity and quality of the milk produced. Full particulars of the arrangements made by the colleges for this purpose will be published in a later number of this *Journal*.

Sclerotium Disease.

In the majority of instances, parasitic fungi are limited in their attacks to one or at most a few kinds of closely related plants. The sclerotia-forming fungi are, however, a marked exception to this rule, and attack indiscriminately almost every kind of plant. Among economic plants that suffer are potatoes, turnips, carrots, peas, beans, cucumbers and marrows.

Decorative plants also suffer to a considerable extent, especially snowdrops, lilies, tulips, and allied kinds propagated by bulbs. Weeds are also attacked.

In addition to growing as parasites on living plants, these fungi flourish vigorously on decaying vegetable matter, and can practically be found on every heap of decaying plants, from whence spores are scattered far and wide, some forming new colonies on dead and others on living plants.

Several kinds of *Sclerotinia* are parasites, but as the general appearance and mode of life, and also the method of treatment, are similar for all, it is not necessary to discuss these separately.

An early indication of the disease is wilting and yellowing of the leaves, followed by drooping of the stem when present. When this stage is reached, the stem or leaves just above ground are covered with a whitish fluffy mould, which soon changes to a brownish colour and liberates clouds of minute spores when rubbed. This is the earliest and most frequent form under which the fungus appears, and is called the *Botrytis* stage. In potatoes, beans, &c., the fungus passes up the inside of the stem, and there forms numerous solid bodies, varying in size from a turnip seed to a grain of wheat. These bodies, called sclerotia, are at first pale in colour, becoming black outside when mature. In this condition sclerotia remain until the following season, when,

owing to decay of the host-plant, they fall to the ground and produce spores which infect a new crop.

The fruit produced by sclerotia may either be of the *Botrytis*

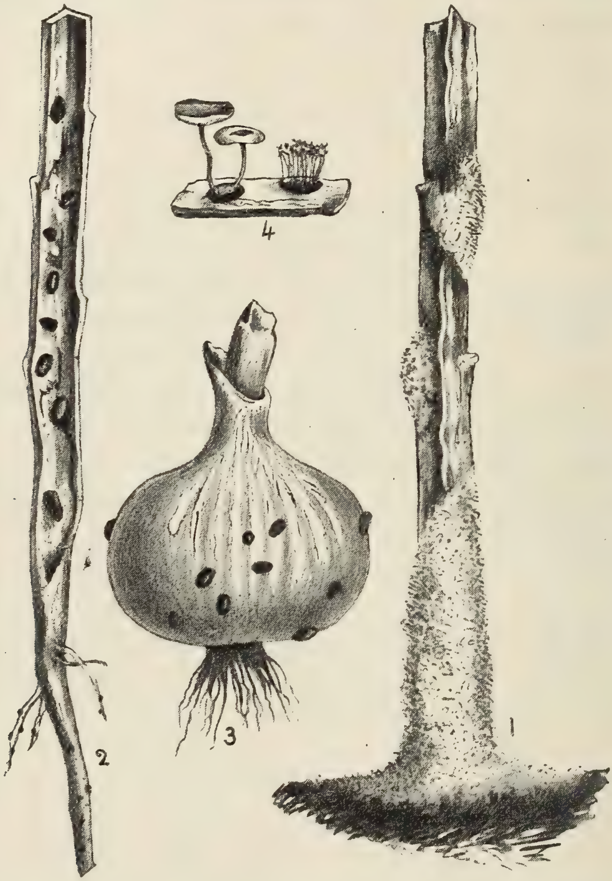

FIG. 1.—Portion of a potato haulm with the *Botrytis* form of fruit starting from the ground line.
FIG. 2.—Portion of a potato haulm split open, showing black sclerotia inside.
FIG. 3.—An onion with sclerotia attached to the scales.
FIG. 4.—The two forms of fruit growing from sclerotia.

form, or less frequently resemble a slender, long-stalked wine-glass of a clear brown colour.

Rotting of turnips and swedes, and "yellow blight" of potatoes are instances of the injury caused by this disease.

In bulbous plants the sclerotia are formed in the bulb.

The great prevalence of this disease is due to plants containing sclerotia being left on the land. Placing such diseased

plants in the piggery or on the manure heap does not destroy sclerotia, which pass through the digestive tract of an animal without injury; in fact, they really benefit by the process.

Collecting and burning all infested stems, leaves, and bulbs is the only certain means of destroying the fungus.

Accumulations of decaying vegetable matter act as nurseries for the growth and dissemination of *Botrytis*, and should not be allowed in a garden.

Gas-lime or quicklime should be applied to land where the disease has existed.

Scale Insect on Plum Trees.

The Brown Currant Scale (*Lecanium persicæ*) is found on plum trees, and a variety on currants. The bodies of the female insects after their eggs have been laid, wither and form a protecting shield or covering. The larvæ leave the protection of the shield under suitable weather conditions and swarm all over the plant. The infested tree should be treated with caustic alkali wash prepared as follows:—First dissolve 1 lb. of commercial caustic soda in water, then 1 lb. of crude potash (or "potashes" or pearl ash) in water. When both have been dissolved, mix the two well together, then add ¾ lb. of soft soap or agricultural treacle, stir well and add sufficient water to make up to ten gallons.

As the wash has a burning effect on the hands, care must be taken in employing it. Rubber gloves are sometimes used to protect the hands, but these, unless close fitting, allow the wash to run under the rubber, and more harm is done than usual. With ordinary care the sprayers need suffer little inconvenience.

When the spring comes round, very careful observation should be kept for signs of fresh infestation, and then a wash of weak paraffin emulsion should be applied, made by dissolving 2 lb. of soft soap in boiling water, adding two gallons of kerosene or paraffin oil, and churning the mixture with a force-pump until it is of the consistency of cream. Forty gallons of water must be added to this.

The application of the caustic alkali wash to fruit trees in

winter is useful in aiding the destruction of several other injurious insects, such as the Codlin Moth and Woolly Aphis. The wash also removes moss and lichens, and thus destroys the favourite quarters of many hibernating insects. (See Leaflet No. 70.)

The Cockchafer in its Relation to Forestry.*

The Cockchafer (*Melolontha vulgaris*) is one of the most troublesome insects in forestry, both beetles and grubs being harmful. The beetles during their flight-period devour the leaves of trees, chiefly broad-leaved species, but the needles of larch and the male cones of pine and spruce are also eaten. The grubs are extremely harmful to the roots of young conifers, *e.g.*, pines of various species, spruce, larch, cypress, and in a less degree to silver fir; some broad-leaved species, *e.g.* beech, are also attacked. The younger roots may be bitten clean through, while older and better grown ones have their bark gnawed away. The leaves of these attacked plants turn yellow and the whole plant withers away. This discolouration of leaf and withering may not appear immediately in young conifers, and the grubs may have moved to other plants before those whose roots have been destroyed show marked signs of withering. That the grubs are at work may also be known by nursery plants being blown over by the wind, owing to their roots being bitten through.

Description of Insect in its various stages.

Adult Beetle.—The beetle is often an inch in length, with the head and front portion of the body black, the wing cases being reddish-brown, hairy, and with five raised lines on each; along each side of the abdomen are five white triangular marks. The abdomen ends in a prolongation downwardly curved and not covered by the wing cases. The end joints of the short antennæ form a kind of club or fan, made up in the male of seven leaves and in the female of six.

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* An account of the Cockchafer, one of the Chafer-Beetles, is also given in Leaflet No. 25, entitled, "Chafer-Beetles or White Grubs."

Larva.—The grubs are thick, fleshy, and dirty white, the tail end of the body being swollen and darker in colour; the head is shining brown, the mouth being provided with strong mandibles; the legs are paler brown; the joints of the body are wrinkled and covered on the upper surface with bristles. In the soil the grub lies curled on one side.

Pupa.—The pupa is naked, lying in the soil.

Life History.

The female beetle burrows into the earth and lays her yellow-white eggs, some seventy in all, in little heaps of twelve to thirty, and after four to six weeks the grubs hatch out. The adult beetles are found in May and June. The grubs hatched, say, in June and July of 1904, feed in the summer and autumn of this year, and then during the late spring, summer and autumn of the next two years, completing their feeding in June or July of 1907, when pupation will take place in the soil. The period of pupation is comparatively short, so that the beetles are ready by October or November, 1907, but they will not come above ground until May or June of 1908. In the cold months of the year the grubs cease feeding, and go deeper into the soil for protection. While in our country a new generation of beetles may be expected every four years, the development is shorter by a year in warmer countries, and longer by a year in colder.

Preventive and Protective Measures.

(*a*) The beetles lay most willingly on light soil and on places exposed to the sun, that is, on land not covered by a tall crop; it is therefore advisable to avoid a "clear cutting" on a large area in a swarm year, or in the year before swarming.

(*b*) Grass land is often infested with the grubs; plantings therefore of young conifers adjoining such should be separated from the grass land by a narrow trench to prevent the passage of the grubs into the nursery.

(*c*) Ball planting with vigorous plants.

(*d*) Collecting the grubs during the preparation and working of the soil. The diligent collection of grubs on quite a small area before and after planting resulted in a recent case in the discovery and destruction of 3,000 grubs.

Destructive Measures.

1. Collecting the beetles, taking care to begin with the earliest of the year's flight. The beetles, which fly in the evening, are to be found in the early morning and the daytime collected on trees, from which they should be shaken or beaten down with long poles on to cloths spread out for the purpose. The beetles can be killed by dropping them into a little paraffin, or into boiling water, or if carried home in bulk they can be easily and quickly killed by exposing them in an air-tight receptacle to the fumes of bisulphide of carbon.

2. When the grubs have got to work, they may be dug up by a trowel or small spade. In addition to the symptoms of attack previously mentioned, where withering of the parts above ground has not yet revealed itself, badly infested plants will be found to come away in the hand with gentle pulling, and the grubs will be found either at the roots of these or neighbouring plants.

On removal of the grubs from the roots of attacked plants, there is some chance of recovery for the plant if the damage already done has not been excessive. In an infestation recently noticed where injury had been done to larch, Scots pine, Austrian pine, spruce, and cypress, the larch, followed by Lawson's cypress, was found to show the greatest recuperative power; Scots pine, Austrian pine and spruce failed to recover.

3. *Traps.*—The larvæ may be trapped. For this purpose pieces of turf from 8 to 12 in. broad and 6 to 8 in. thick should be laid on the surface of the ground with the grass downwards; beneath which the larvæ collect. Holes may be made here and there and filled with alternate layers of moss and dung or earth. These holes, especially if prepared in the autumn, may serve as places of hibernation for the grubs, and later as places of egg laying for the swarming beetles. All such traps must be regularly visited and renewed.

4. *Trap Plants.*—On a small scale the plan of sowing lettuce and strawberry plants between the rows of young conifers or broad-leaved species has been practised with success. The cockchafer grubs are very fond of these plants, and take them in preference to the others. These two trap plants have also this

Young Scots Pine killed by larva of cockchafer ($\frac{4}{5}$ nat. size).

Young Austrian Pine, showing characteristic damage by larva of cockchafer ($\frac{2}{3}$ nat. size).

advantage that their leaves very quickly wither when their roots are attacked, and this withering reveals the presence of the grub. Regularly in the afternoon the plants should be gone over, and those showing signs of withering pulled up and the grubs taken out. The grubs will probably not be found at the roots of completely withered plants, but will have moved to others.

5. The encouragement of birds and mammals that willingly devour these pests, such as rooks, starlings, green plovers, night-jars, owls, and black-headed and common gulls, bats and moles.

6. *Insecticides.*—There have been many experiments with a view to killing the grubs by the injection into the soil of certain insect-killing fluids, but little success has resulted. Great interest was aroused some years ago by experiments that had for their object the inoculation of the grubs with a disease- and death-causing fungus, but the difficulties in the way of a proper infection of the grubs are too great to allow of success.

Quebracho Wood in Argentina.

Among the countries which compete with the home production of oak-bark are Argentina and Paraguay, which produce a valuable wood, viz., the Quebracho, from which tannin is obtained. In addition to producing tannin in its bark, like the oak, chestnut, and other trees, it also contains, like them, some in its sapwood, and stores it in a concentrated state in considerable quantity in the whole of the central part of the wood. According to Charpentier, its bark contains from 6 to 8 per cent. of tannin ; the sap, 3 to 4 per cent.; and the heart, 19 to 22 per cent. As the heart of the Quebracho represents two-thirds and often three-quarters of the total quantity of wood, the amount of tannin contained in this variety is considerable. It is inferior, however, to oak-bark taning material, and it contains colouring matters which are difficult to separate. The importation of this wood, however, is probably one of the causes of the present unremunerative price of English oak-bark.

According to the Trade Returns of Argentina, the exports are chiefly made in the form of wood or of Quebracho extract.

There is also an insignificant export in the form of coarse sawdust. The exports of Quebracho wood first began to assume importance in 1888, when some 7,000 tons were exported, and from that time they rose very rapidly till 1895, when they amounted to 170,000 tons. In that year, however, the tannin in the form of extract began to be exported, and this had apparently some effect in checking the rapid extension of the trade in the natural wood, which amounted, however, in the five years, 1899-1903, to an average of 200,000 tons annually. The exports of the extract increased from about 400 tons in 1895 to 9,000 tons in 1902 and 12,000 tons in 1903. The United Kingdom appears to be the largest consumer of the wood in its raw state. According to the Argentine returns, the quantity shipped to this country in the five years 1899–1903 averaged 140,000 tons annually. In the case of the extract, the United States and Germany appear as the principal purchasers, but some 1,400 tons came to Great Britain.

Some information respecting this product was recently furnished in a German Consular Report,* from which it appears that there are two sources of supply; one including the Province of Santiago and part of the Province of Tecuman, and the other embracing the northern part of Santa Fé and the banks of the Parana River. The former occupies a secondary position both as regards the amount of tannin in the wood, the density of the trees, distance from river-ports, and other conditions. The principal source of supply forms the south-western part of the great plains known as the "Gran Chaco," which stretch northward from Santa Fé. The profitable exploitation of the Quebracho is at present restricted to the district opened up by the railway which goes from Santa Fé northwards to La Sabana on the boundary of the Chaco territory. This railway runs through the Quebracho country for a distance of 40 to 60 miles parallel to the river and has a branch line about midway, near Vera, to Reconquista on the Parana River.

The yield of Quebracho wood is estimated at an average of 12,500 tons per square league of 6,250 acres, or about two tons per acre. About 100 medium-sized trees represent the average

* *Zeit. für Forst-und-Jagdwesen*, Aug., 1904.

crop obtained from 125 acres. In Paraguay the yield is somewhat more. As a means of transport there exist at present only the railway named above and the Parana River, and distance from these commercial routes is a most important consideration in the development of the trade. The cost of transport becomes excessive when the distance exceeds 10 to 15 miles, as the haulage has to be done by oxen and the roads or tracks are usually very bad. In order to shorten the transport and free themselves from the railway monopoly, several firms are endeavouring to construct their own railway connection with the Parana ports.

Particulars of the total extent of the Quebracho country are not available, but it is probable that large quantities of this timber exist, though at the present time only the smallest part is economically valuable, as the trees are so thinly distributed over great areas.

French Agricultural Budget.

The Budget of the French Ministry of Agriculture for the year 1905, as revised by the Budget Commission, amounts to £1,755,000. The various purposes to which the money is applied will be gathered from the following table :—

	£
Salaries and expenses of the Central Administration and miscellaneous expenses	60,700
Assistance to agriculturists for losses from hail, fire, floods, &c.	62,000
Subventions to mutual insurance societies	36,000
Agricultural and horticultural education	155,100
Miscellaneous subventions, prizes, rewards, &c.	84,200
Bounties for silkworm culture and cultivation of flax and hemp	259,100
Protection of vineyards against phylloxera	9,400
Prevention of fraud in butter and margarine	5,900
Veterinary schools	44,600
Diseases of animals, compensation, &c.	42,600
State horse-breeding establishments	315,700
Irrigation, drainage, embankment, &c.	126,700
Management of State forests	552,600
	1,754,600

In addition to the expenditure shown above on agricultural and veterinary education, an item of £7,000 is included in the expenditure on the State forests for the forestry schools at Nancy and Barres.

There are certain receipts from the educational institutions for fees, sale of produce, &c., which amounted in 1902 to £30,560, while the receipts from the breeding establishments came to £64,783, and the forest revenue to £1,406,320.

Insurance of Agricultural Produce against Fire.

The Board of Agriculture and Fisheries think it desirable to direct the attention of farmers to the importance of ascertaining whether the property insured by them against loss by fire includes or excludes growing crops. In a recent case of the destruction by fire of hay and straw in the stack, it was claimed by the company, and decided in their favour, that the insurance included growing crops, and that, consequently, under the operation of the "average clause," it was necessary, in order to obtain payment to the full value insured, that these crops, together with the whole of the other produce, should have been insured to at least three-fourths of their value.

The "average clause," which is now adopted by the fire offices generally as a condition in farming insurances, is to the effect that if the sum insured on agricultural produce, either separately or in one amount with other property, shall, at the breaking out of a fire, be less than three-fourths of the value of all the property insured in that amount, then the insured shall be considered as being his own insurer for the difference between the sum insured and the full value of the property insured at the time of the fire, and shall bear a rateable share of the loss accordingly. The effect of this condition would seem to be that if the value, immediately after harvest, of the agricultural produce, implements and utensils of husbandry, exclusive of live-stock, over the entire farm (including growing crops, if included in the insurance) was £600, and the sum insured only £300, then, in the event of fire, the office will be liable to pay only

one-half of the amount of loss, whether that half be £300 or any smaller sum, the insured being regarded as his own insurer for the difference and bearing a rateable share of the loss accordingly. Farmers, therefore, wishing fully to protect themselves, must insure for not less than three-fourths of the full value, immediately after harvest, of any agricultural produce they desire to insure.

The practice of insurance companies may possibly differ as to the insurance of growing crops, but if it is desired that they should be excluded from the agricultural produce to be insured, care should be taken to see that the fact is clearly stated in the policy.

Meetings of Agricultural Correspondents.

A meeting of the Agricultural Correspondents appointed by the Board in Fifeshire was recently held at Cupar with a view to discussing together the general instructions issued by the Board as to their duties. Opportunity was also taken to consider other subjects connected with the work of the Board or of general agricultural interest, and a note of the principal points referred to was forwarded to the Board.

Meetings of this character could, no doubt, frequently be arranged without expense to the public funds by selecting some central place convenient to several Correspondents, and Lord Onslow is of opinion that such meetings are likely to be very helpful. Arrangements would be made, where possible, for the attendance of one of the Board's Inspectors.

Report on Agricultural Education.

The grants made by the Board of Agriculture and Fisheries in aid of agricultural education in the financial year 1903–1904 amounted to £9,200. These were distributed among sixteen different institutions, including the principal agricultural colleges in England and Wales, as well as several agricultural and dairy schools, and the National Fruit and Cider Institute. Special grants, amounting to £650, were also

made for experiment and research. Particulars relating to the allocation of these sums are given in Dr. Somerville's Annual Report* on this side of the Board's work, and the same volume contains an outline of the courses of instruction given at the several institutions, together with particulars as to the attendance at the internal and external classes. From these it appears that the number of students in attendance at definite internal courses extending over longer or shorter periods has during the past year considerably exceeded a thousand; while the figures for the external audiences are estimated at something over 22,000. In the latter case, the course may have comprised a dozen or more lectures, though in many instances a centre has taken only one or two lectures; still, the number of those who have been directly reached by organised instruction provided by the various colleges, schools, and institutes is a very large one, and justifies the conclusion that these institutions constitute a factor of much importance in the agricultural situation.

In this connection, Dr. Somerville observes that for young men who can leave home for systematic instruction, the colleges, as a rule, offer an ample choice of courses, which may extend over any period from a few weeks to two or more years. But the great majority of young farmers are so tied down by the nature of their employment as to be unable to give continuous attendance to central classes, and for them short evening courses in villages and small country towns are of special importance. Such courses may embrace only three or four lectures, or they may extend to weekly meetings throughout the whole winter, in which case a large amount of useful information may be imparted. Such courses, being designed for the immediate needs of practical men, should not be too academic in character, that is to say, they should deal rather with facts than with principles, or, otherwise expressed, they should be instructional rather than educational. A no inconsiderable part of the value of these lectures consists in the discussion by which each should be followed. Farmers should be encouraged to give their own experiences and to state their difficulties, and much valuable in-

* Report on the Distribution of Grants for Agricultural Education in 1903–4. [*Cd.* 2321] *Price* 10d.

formation may be exchanged by the process of question and answer.

The provisions made, and the facilities offered, by the Board of Education for the education of those who come within their purview, so far as these provisions and facilities bear upon rural districts, are given in an Appendix, and a summary is also furnished of the work in agricultural education undertaken in the several counties of England and Wales. This statement shows the various fields into which the subject of technical education in Rural Economy is divided, and the manner in which the ground is covered in the various counties. Some have a thorough organisation, and neglect no subject that may be considered essential to some section or other of the rural population, while others are defective alike in organisation and in educational results. It has been the policy of the Board of Agriculture to exert their influence in the direction of securing effective organisation, and in endeavouring to stimulate local effort to provide educational facilities in conformity with local requirements, and this statement is intended to show in a convenient form the directions in which local action requires strengthening.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of November, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 8	7 3	38 0	34 5
Herefords	7 7	7 1	—	—
Shorthorns	7 7	7 0	37 0	33 7
Devons	7 10	7 3	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	7¾	7¼	8½	6½
Sheep :—				
Downs	8¾	8	9	8
Longwools	8¼	7½	8½	7½
Cheviots	8¾	8¼	8¾	7½
Blackfaced	8½	7¾	8¼	7¼
Cross-breds	8½	8	9	8
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	5 7	5 3	5 8	5 1
Porkers	6 5	6 1	6 4	5 7
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
In Milk	21 5	18 2	20 6	16 8
Calvers	20 6	17 14	19 11	16 5
Calves for Rearing	2 3	1 15	1 15	1 4
Store Cattle :—				
Shorthorns—Yearlings ...	9 4	7 19	10 4	8 7
,, Two-year-olds	13 1	11 9	13 18	12 0
,, Three-year-olds	15 9	14 6	15 13	14 5
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools—Hoggs, Hoggets, Tegs and Lambs	38 5	33 3	—	—
Scotch Half-breds ,, ...	—	—	31 11	26 4
Store Pigs :—				
Under 4 months	23 3	16 10	20 11	14 4

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of November, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	50 2	47 10	45 6	49 0	56 0*	54 10*
	2nd	46 8	42 0	37 4	43 2	51 4*	45 6*
Cow and Bull ...	1st	—	40 10	36 2	42 0	42 0	37 4
	2nd	—	33 10	31 6	30 4	30 4	32 8
U.S.A. and Canadian :—							
Birkenhead killed	1st	46 8	45 6	43 2	46 8	44 4	—
	2nd	43 2	39 8	38 6	38 6	38 6	42 0
Argentine Frozen Hind Quarters ...	1st	24 6	24 6	25 8	26 10	26 10	28 0
American Chilled Hind Quarters ...	1st	50 2	52 6	51 4	52 6	53 8	53 8
VEAL :—							
British	1st	67 8	57 2	63 0	64 2	—	—
	2nd	60 8	46 8	54 10	47 10	—	—
MUTTON :—							
Scotch	1st	73 6	—	72 4	73 6	73 6	71 2
	2nd	66 6	—	66 6	65 4	64 2	56 0
English	1st	67 8	65 4	70 0	71 2	—	—
	2nd	59 6	51 4	63 0	61 10	—	—
Argentine Frozen ...	1st	35 0	35 0	35 0	35 0	35 0	36 2
LAMB :—							
New Zealand ...	1st	57 2	57 2	53 8	53 8	56 0	—
	2nd	52 6	—	—	—	—	—
PORK :—							
British	1st	54 10	56 0	58 4	57 2	49 0	50 2
	2nd	47 10	47 10	46 8	45 6	46 8	45 6

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each of the under-mentioned Weeks in 1904, and in the corresponding Weeks in 1903 and 1902.

Weeks ended (*in* 1904).	Wheat.						Barley.						Oats.					
	1902.		1903.		1904.		1902.		1903.		1904.		1902.		1903.		1904.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 2 ...	27	7	25	0	26	3	26	7	23	11	22	1	19	10	16	10	15	5
,, 9 ...	27	8	24	11	26	6	26	7	24	1	22	6	20	0	17	0	15	7
,, 16 ...	27	8	24	11	26	11	26	11	24	1	22	3	20	0	16	10	15	9
,, 23 ...	27	7	25	0	27	3	26	7	24	1	22	4	20	3	16	11	15	11
,, 30 ...	27	4	25	4	26	11	26	7	24	3	22	3	20	2	17	0	15	8
Feb. 6 ...	27	2	25	6	26	9	26	9	23	9	22	4	20	3	16	11	15	11
,, 13 ...	26	11	25	6	26	8	27	5	23	7	22	2	20	3	17	1	15	9
,, 20 ...	27	1	25	4	26	11	26	11	23	4	22	7	20	4	17	1	16	0
,, 27 ...	27	1	25	3	27	10	26	8	23	2	22	4	20	5	17	1	16	3
Mar. 5 ...	27	0	25	3	28	8	26	8	23	1	22	6	20	5	17	1	16	5
,, 12 ...	27	1	25	1	29	1	26	6	22	10	22	5	20	6	17	0	16	8
,, 19 ...	27	1	25	1	28	6	26	4	22	9	22	9	20	6	16	10	16	7
,, 26 ...	27	2	25	2	28	2	27	2	22	4	22	8	20	7	17	0	16	7
Apl. 2 ...	27	3	25	3	27	11	26	5	22	6	22	10	20	6	17	0	16	6
,, 9 ...	27	5	25	4	27	10	26	7	21	10	22	5	21	0	17	2	16	5
,, 16 ...	27	7	25	6	27	9	27	1	21	6	22	6	21	1	17	3	16	4
,, 23 ...	28	9	26	1	27	9	26	5	21	9	22	0	21	6	17	9	16	4
,, 30 ...	29	9	26	10	27	8	27	5	22	1	21	1	21	10	18	0	16	3
May 7 ...	30	9	27	6	27	4	26	10	21	10	20	8	22	6	18	2	16	7
,, 14 ...	31	1	27	9	27	1	25	3	22	5	19	10	22	5	18	4	16	6
,, 21 ...	31	6	27	10	26	9	25	4	23	7	20	4	22	6	18	5	16	7
,, 28 ...	31	6	27	8	26	9	25	1	23	7	19	8	22	10	18	5	16	7
June 4 ...	31	3	27	6	26	10	24	3	23	10	18	8	22	11	18	4	16	8
,, 11 ...	30	11	27	8	26	6	23	8	21	5	18	5	22	8	18	7	16	10
,, 18 ...	30	6	27	6	26	5	23	5	20	7	18	2	23	0	18	3	16	8
,, 25 ...	30	5	27	6	26	5	24	3	22	0	19	2	22	9	18	6	16	10
July 2 ...	30	8	27	9	26	4	25	5	20	7	18	8	22	5	18	6	17	1
,, 9 ...	30	10	28	1	26	6	24	8	19	11	19	8	22	10	18	3	17	1
,, 16 ...	30	11	28	3	26	10	23	8	20	5	18	9	22	10	18	7	17	6
,, 23 ...	31	5	28	7	27	7	25	0	20	10	18	10	22	8	18	5	17	6
,, 30 ...	31	8	28	11	28	0	25	0	21	0	19	9	22	10	18	6	17	10
Aug. 6 ...	31	7	29	3	28	3	24	11	20	1	19	9	22	11	18	8	17	10
,, 13 ...	31	7	29	11	28	4	24	9	21	3	19	9	22	2	18	10	17	7
,, 20 ...	31	5	29	9	28	8	22	10	20	4	22	5	21	11	18	6	16	7
,, 27 ...	31	7	30	0	29	5	26	2	22	3	23	2	21	0	18	7	16	5
Sept. 3 ...	29	9	30	3	30	2	24	6	22	5	25	3	19	10	18	5	16	3
,, 10 ...	27	10	28	6	30	0	27	5	22	4	24	10	19	2	17	0	16	1
,, 17 ...	27	1	27	5	29	7	26	4	24	2	24	9	18	4	16	4	15	11
,, 24 ...	26	6	27	0	29	10	26	4	24	0	25	10	18	0	16	2	15	9
Oct. 1 ...	25	10	26	3	29	10	25	11	23	9	25	5	17	5	15	9	15	8
,, 8 ...	25	5	25	10	30	2	26	2	23	8	25	6	17	2	15	6	15	9
,, 15 ...	25	1	25	8	30	5	26	1	23	9	25	4	17	0	15	5	15	8
,, 22 ...	24	11	25	10	30	4	26	4	23	7	25	5	17	0	15	8	15	11
,, 29 ...	25	0	26	0	30	6	26	7	24	2	24	11	17	3	15	8	15	10
Nov. 5 ...	25	1	26	4	30	6	26	3	24	3	25	0	17	2	15	9	16	0
,, 12 ...	25	0	26	6	30	3	25	11	24	6	24	6	17	3	15	9	15	11
,, 19 ...	24	11	26	9	30	2	25	6	24	3	24	5	17	2	15	10	16	0
,, 26 ...	25	0	26	6	30	5	24	11	23	11	24	4	17	0	15	11	16	1
Dec. 3 ...	25	1	26	8	30	4	24	4	23	9	24	6	17	0	15	9	16	2
,, 10 ...	25	0	26	7	30	4	24	3	23	2	24	4	16	10	15	9	16	2
,, 17 ...	24	10	26	9			24	2	23	0			16	10	15	7		
,, 24 ...	24	10	26	5			24	1	22	5			16	8	15	6		
,, 31 ...																		

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN and BRESLAU.

—		Wheat. 1903.	Wheat. 1904.	Barley. 1903.	Barley. 1904.	Oats. 1903.	Oats. 1904.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	October ...	36 1	38 0	22 6	23 0	17 0	17 6
	November ...	36 1	39 1	22 5	23 1	16 10	17 8
Paris:	October ...	36 4	40 4	22 8	23 3	17 2	18 11
	November ...	35 5	40 4	22 5	23 3	17 4	19 1
Belgium:	September ...	27 11	30 11	22 1	22 4	15 9	18 7
	October ...	27 11	31 6	22 1	23 0	15 9	19 9
Berlin:	September ...	34 8	38 11	—	—	18 10	19 11
	October ...	34 3	38 9	—	—	18 6	19 7
Breslau:	September ..	33 2	37 1	23 0	25 9	17 10	19 2
	October ...	33 4	36 7	23 2	25 7	16 7	18 5

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets.*

AVERAGE PRICES of **British Wheat, Barley** and **Oats** at certain Markets during the Month of November, 1903 and 1904.

—	Wheat. 1903.	Wheat. 1904.	Barley. 1903.	Barley. 1904.	Oats. 1903.	Oats. 1904.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	26 10	30 9	24 6	23 11	16 4	17 2
Norwich	26 8	30 3	22 8	25 3	14 10	15 4
Peterborough ...	25 0	30 1	22 10	23 8	14 8	15 10
Lincoln	25 6	29 5	24 8	23 10	15 4	15 6
Doncaster	25 6	28 11	24 8	22 11	15 9	15 3
Salisbury	26 11	29 7	24 1	24 1	16 4	15 11

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of November, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British... ...	14 9	12 10	—	—	—	—	15 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	106 0	104 0	108 9	102 9	105 4	98 0	109 9	106 9
Danish ...	114 3	111 6	118 3	114 6	116 0	114 0	116 0	—
Russian ...	96 6	91 6	—	—	92 3	86 6	93 0	85 3
Australian ...	103 0	100 0	—	—	—	—	105 0	102 0
New Zealand...	99 3	96 0	—	—	—	—	107 0	—
Canadian ...	97 0	94 6	101 3	97 0	100 6	94 6	102 4	—
CHEESE :—								
British Cheddar	66 0	59 6	—	—	67 0	61 0	57 0	53 0
			120 lb.	120 lb.	120 lb.	120 lb.		
,, Cheshire	—	—	68 6	57 6	67 0	60 3	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	49 0	47 6	49 3	45 6	48 3	44 9	49 6	46 0
BACON :—								
Irish	54 9	49 6	53 6	50 0	53 9	51 9	54 6	51 6
Canadian ...	47 0	44 6	50 3	47 0	48 9	45 9	49 9	46 3
HAMS :—								
Cumberland ...	100 6	80 0	—	—	—	—	—	—
Irish	95 6	72 6	—	—	—	—	88 0	78 0
American ...	51 9	49 3	49 6	46 9	48 6	45 9	50 6	47 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	19 0	14 8	—	—	—	—	—	—
Irish	18 1	14 4	13 0	10 10	12 9	11 4	12 9	11 3
Danish ...	15 6	13 7	13 5	10 11	13 6	12 9	13 8	11 10
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Blackland ...	61 3	53 9	44 6	40 0	45 0	40 0	—	—
British Queen	70 0	60 0	—	—	45 0	40 0	58 9	50 0
Up to Date ...	71 3	61 3	80 0	43 0	45 0	36 8	50 0	45 0
HAY :—								
Clover... ...	85 0	74 0	83 9	66 8	80 0	70 0	70 0	65 0
Meadow ...	75 6	62 0	60 0	53 4	57 6	45 0	—	—

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	NOVEMBER.		11 MONTHS ENDED NOVEMBER.	
	1904.	1903.	1904.	1903.
Swine-Fever:—				
Outbreaks	55	109	1,140	1,379
Swine Slaughtered as diseased or exposed to infection ...	308	640	5,343	7,302
Anthrax:—				
Outbreaks	77	65	932	696
Animals attacked	90	96	1,395	1,043
Glanders (including Farcy):—				
Outbreaks	94	94	1,427	1,362
Animals attacked	170	179	2,496	2,344
Sheep-Scab:—				
Outbreaks	79	206	1,090	1,438

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	NOVEMBER.		11 MONTHS ENDED NOVEMBER.	
	1904.	1903.	1904.	1903.
Swine-Fever:—				
Outbreaks	—	10	180	166
Swine Slaughtered as diseased or exposed to infection ...	50	276	4,102	3,873
Anthrax:—				
Outbreaks	1	—	4	3
Animals attacked	4	—	7	10
Glanders (including Farcy):—				
Outbreaks	1	1	11	4
Animals attacked	3	1	34	5
Rabies (number of cases):—				
Dogs	—	—	—	2
Sheep-Scab:—				
Outbreaks	*13	*39	*391	*446

* These figures refer to October, and to the periods ending October, respectively.

LIST OF LEAFLETS ISSUED BY THE BOARD OF AGRICULTURE AND FISHERIES.

No.	Title.	No.	Title.
	(1.) Leaflets relating to Acts of Parliament.		
8	Farmers and Assessments to Local Rates.	26	Farmers and the Income Tax.
18	Fertilisers and Feeding Stuffs Regulations, 1897.	27	Remission of Tithe Rentcharge.
		39	Assessments to Land Tax.
		66	Workmen's Compensation Act, 1900.
	(2.) Leaflets dealing with Farm Animals, including Poultry.		
13	Acorn Poisoning.	89	Fluke, or Liver Rot in Sheep.
21	Warble Flies.	95	Ringworm in Cattle.
28	Anthrax.	96	Parturient Apoplexy.
29	Swine Fever.	100	Pig Breeding and Feeding.
57	External Parasites of Poultry.	101	Prevention of White Scour in Calves.
58	Internal Parasites of Poultry.	102	Quarter Ill, Quarter Evil, or Black Leg.
61	Sheep Scab.		
67	Favus in Poultry.	108	Contagious Abortion in Cattle.
78	Liver Disease of Poultry.	114	Feeding of Poultry.
81	A Substitute for Dishorning.	118	Sheep Nostril Fly.
82	Preparation of Wool for Market.	119	Sturdy or Gid in Sheep.
83	Preservation of Eggs.		
	(3.) Leaflets dealing with Miscellaneous Subjects.		
6	Voles and their Enemies.	93	Farmyard Manure.
9	Ensilage.	97	Farmers' Co-operative Societies.
32	Foul Brood or Bee Pest.	98	Grading and Packing Fruit and Vegetables.
36	Cultivation of Osiers.		
63	Destruction of Charlock.	99	Relationship of Woods to Domestic Water Supplies.
72	Purchase of Artificial Manures.		
73	Cultivation of Maize for Fodder.	106	Fertilisers for Market Garden Crops.
74	Purchase of Feeding Stuffs.	110	Carriage of Milk by Rail in Locked Cans.
79	Rations for Farm Stock.		
80	Use of Artificial Manures.	111	Co-operative Egg and Poultry Societies.
85	Haymaking.	112	Weeds and their Suppression.
	(4.) Leaflets dealing with Wild Birds.		
40	Kestrel or Wind-hover.	50	Water Wagtails or "Dish-washers."
42	Short-Eared Owl.	51	White or Barn Owl.
43	Titmice.	54	Spotted Flycatcher.
44	Lapwing, Green Plover, or Peewit.	55	Swallow.
45	Starling.	84	House-sparrow.
	(5.) Leaflets dealing with Insects and Fungi injurious to Crops.		
1	Black Currant Mite.	52	Gooseberry Mildew.
2	Vine, Plum, Hop and Raspberry Weevils.	53	Pear Midge.
3	"Flea" Beetles.	56	Canker Fungus.
4	Winter Moths.	60	Goat Moth & Wood Leopard Moth.
5	Mangold Fly.	62	Pear and Cherry Sawfly.
10	Wireworms.	64	White Root Rot.
11	Daddy Longlegs or Crane Fly.	65	Small Ermine Moths.
12	Gooseberry Sawfly.	68	Currant Aphides.
14	Raspberry Moth.	69	Tent Caterpillars.
15	Apple Blossom Weevil.	70	Winter Washing of Fruit Trees.
16	Apple Sucker.	75	Root-knot Disease in Cucumbers and Tomatoes.
19	Pea and Bean Weevils.		
20	Magpie Moth.	76	Cucumber and Melon Leaf Blotch.
22	Diamond-back Moth.	77	Finger-and-Toe in Turnips.
23	Potato Disease.	86	Brown Rot of Fruit.
24	Ribbon-footed Corn-fly.	87	Fungus Disease of Young Fruit Trees.
25	Chafer-beetles or White-grubs.	88	Hop Aphis.
30	Codling Moth.	90	Pith Moth.
31	Onion Fly.	91	Pine Beetle.
33	Surface Caterpillars.	92	Bunt and Smut.
34	Woolly Aphis or Apple Root Louse.	94	Millipedes and Centipedes.
35	Celery Fly.	103	Pine Sawfly.
38	Carrot Fly.	104	Aphides or Plant Lice.
41	Red Spiders.	105	Black Scab of Potatoes.
46	Stem Eelworm.	109	Cabbage Moth.
47	Asparagus Beetle.	113	Dry Rot.
48	Pea and Bean Thrips, or Black Fly.	115	Coral Spot Disease.
		116	Sleepy Disease of Tomatoes.
49	Fruit Tree Beetle.	117	Black-Leg or Potato Stem Rot.

The issue of Leaflets 7, 17, 37, 59 *and* 71 *is suspended.*

Single Copies of these Leaflets may be obtained free of charge. Leaflets Nos. 1 *to* 100, *bound in stiff boards, price* 6*d., post free. Applications should be addressed to the Secretary, Board of Agriculture and Fisheries,* 4, *Whitehall Place, London, S.W.*

BOARD OF AGRICULTURE AND FISHERIES.

A Return of Market Prices of Fat and Store Stock, Dairy Cattle, Meat, Provisions, Fruit, Vegetables, Hay and Straw at certain representative Markets in Great Britain is issued *every Wednesday* by the Board of Agriculture and Fisheries, containing information for the week ending with the previous Saturday.

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The "Labour Gazette" is issued on the 15th of each month, and may be obtained direct from the publishers, Messrs. Horace Marshall & Son, Temple House, Temple Avenue, London, E.C., at the rate of 2s. per annum, post free. Copies may also be ordered through any newsagent, price 1d. each

THE JOURNAL
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JANUARY, 1905. [NEW SERIES.]

THE GROWTH OF SUGAR BEET.

The sugar beet is only a variety of the seashore plant, *Beta maritima*, which, by careful breeding and selection, has been developed along three directions to give us the many different sorts of mangolds, the edible beetroot of our gardens and the sugar beet in question.

In appearance and habit the sugar beet differs but little from the mangold ; it is white fleshed, and has more of the shape of the Long Red than of the Globe mangolds, but it is smaller, grows more deeply in the ground with but little of the bulb exposed, and develops much more fibre on the bulb and root proper than does the mangold. But the main difference between sugar beet and mangold lies in their composition ; for the last hundred years, since the Continental blockade during the Napoleonic wars gave such an impetus to the extraction of sugar from the beet, a process of selecting sugar beets for seed on the basis of their richness in sugar has been continuously going on, until at the present time they contain 20 per cent. or more of dry matter and 18 per cent. of sugar, while the mangold only contains about 12 per cent. of dry matter and 8 per cent. of sugar.

In growing sugar beet for the manufacture of sugar, the composition of the roots is all important; the extraction processes are only economical when the roots contain a high proportion of sugar, and that as free as possible from the non-crystallisable sugars and other soluble bodies. In consequence, most beet sugar factories not only pay for their roots on a scale varying with the proportion of sugar they contain, but will entirely reject consignments of roots which fall below a certain

standard. The necessity of maintaining a high proportion of sugar and of purity means a certain restriction of yield; heavy crops of big roots grown by the use of large quantities of manure, such as are used in this country for the mangold crop, mean roots that are deficient in purity. On the whole, then, sugar beet should be grown on land in good condition from previous cropping rather than on land specially enriched for the crop in question.

Choice of Land.—Sugar beet can be grown wherever mangolds are found, but on the whole they are more suited to lighter and warmer soils than the mangold prefers, dry and warm autumnal conditions being particularly desirable to ripen the roots off. The East and South-East of England, with the South Midlands, are most likely to grow sugar beet of high quality. Strong, well-worked soils give the best returns and peaty soils the poorest; it is necessary that there should be some lime in the soil.

Selection of Seed.—Many varieties have been tried from time to time in this country; the best appears to be the Kleinwanzlebener, which can be obtained from any of the great foreign seed merchants. It is important that the seed should have a high germinating power; at least 70 per cent. of the seed should germinate, and should average two shoots from each germinating seed.

Preparation of the Land.—In English farming sugar beet would take the same place in a rotation as mangolds, and the preparation of the land does not differ markedly from that required for mangolds; it is, however, desirable to attain a deeper and more mellow tilth, since so much of the value of this crop depends upon its quality. It is very necessary for sugar-making to obtain shapely roots, free from forking, and this means a mellow deeply-worked soil. All foreign cultivators insist upon the importance of subsoiling, but this should take place before the winter, so as to give the land time to settle down and consolidate before sowing. If farmyard manure is required it should be spread on the stubble and ploughed in at an early date in the autumn. The best preparation will be to follow up this ploughing, which should be 6 or 7 inches deep, with a subsoiler, working down to another 8 or 10 inches; and

then by a cross ploughing as soon as the land can be worked in the spring, after which it is only necessary to use the cultivator and harrow to work the land down for a seed bed. It is very important to get the first ploughing done in good time before the winter. The seed is best drilled on the flat, not on ridges.

Manuring.—Heavy dressings of farmyard manure are not recommended, because they injure the quality of the sugar beet. In the rotations practised in this country it is difficult to give a coat of farmyard manure to any crop immediately preceding sugar beet, and as the first start of the seed is very much helped by the presence of some easily decomposing organic matter, it will be generally wise to use some dung for this crop, 12 to 16 tons per acre, which, as mentioned above, should be ploughed in before the winter. The other manures required are about 3 cwt. per acre of superphosphate and 1 cwt. per acre of sulphate of potash, which should be sown broadcast and worked in by the last cultivation and harrowing before sowing. On sandy and gravelly land the sulphate of potash should be increased, since the production of sugar is very dependent on a free supply of potash If kainit be used instead of the sulphate of potash, it should be sown before the land is ploughed up for the winter. Valuable as salt is for mangolds, it should not be used for sugar beet.

Nitrogenous manures are necessary, but should be used in smaller quantities than with mangolds; nitrate of soda, again, is not so suitable a manure as sulphate of ammonia, though it produces a larger yield. The nitrate of soda encourages a more deeply rooting habit, and, in consequence, a more prolonged and slowly ripening growth.

If dung has been used in the autumn it will be sufficient to sow 1 cwt. per acre of sulphate of ammonia with the superphosphate and sulphate of potash; in the absence of dung a further 1 cwt. of sulphate of ammonia should be used as a top-dressing when the plants are singled.

Sowing and Cultivation.—The seed should be drilled at th rate of 20 to 30 lb. per acre, the rows being never more than 16 in. apart; indeed, for producing high-grade roots, the best distance between the rows is about 12 in. The plants should be set out early, and finally singled to one in every 9 in. The richer

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the land is, the closer the plants should be left when singling. The later management is practically identical with that of the mangold crop, and consists in cultivating and hoeing to keep the surface loose and the land free from weeds. In hoeing the earth should always be drawn a little towards the plants, as this helps to increase their sugar content.

When in October the outer leaves begin to get yellow and flaccid the crop is ready to lift, which is by no means as easy an operation as lifting the mangold crop, so closely do the fine fibres of the root cling to the ground. On soils of ordinary consistency it is impossible to pull the crop; it is necessary to lift the roots with a fork, an operation which adds seriously to the expense of growing sugar beet as compared with mangolds.

In the case of sugar beet intended for the factory the crown of leaves would have to be twisted off, or the leaves and a little of the tops cut off, and the adhering dirt roughly removed from the roots. The factories usually do the final cleaning and topping and tailing, making their own regulations as to the degree of cleanness of the roots on which they will insist.

The sugar beet leaves do not form a very satisfactory food for stock, and are apt to induce scour; they are best ploughed in, and if fed it must be with caution and in conjunction with a fair proportion of dry food. The slices from which the sugar has been extracted in the factory are usually returned to the farmer providing the roots, and form a good succulent food for the winter feeding of cattle.

The average yield which may be expected is not very heavy; the general average of experiments all over the country in 1898 was 15·7 tons per acre; the average yield in Germany, even where intensive cultivation is practised, is only 10 to 12 tons per acre. Larger yields are only to be obtained by spacing the plants more widely and by increased manuring, with the inevitable result of an inferior quality of root for sugar making.

Use of Sugar Beet as Food for Stock.—In the absence of factories to which the sugar beet crop can be sold, the roots can be clamped and stored like mangolds, to be used in the same way as food for stock. For this purpose it should be remembered that they possess, roughly, twice the feeding value of an equal weight of mangolds. They can be used as food

at an earlier date than mangolds, because they have, as a rule, attained a higher degree of maturity when they are harvested. In feeding they may be used to furnish succulent food for young horned stock, fatting beasts or sheep, especially ewes, but many growers have found them unsuited to cows in milk. Experiments at the Wye College indicated that when fed *ad lib.* to sheep with cake and corn, the sheep eat about twice as much mangold as sugar beet, and thrive rather better on the mangold. Sugar beet should always be sliced or pulped, otherwise, being rather tougher fleshed than mangolds, the animals leave a good deal of waste.

A. D. HALL.

APPLE CULTURE.

The condition of apple culture generally in this country cannot be said to be satisfactory. There are some shrewd cultivators who manage their trees well, and generally get good crops, but a very great increase in the supply could undoubtedly be brought about. The information given below is the result of many years' practical experience, and although it is impossible to deal at any length with the minor details of the subject, it is hoped that sufficient information will be given upon the broad principles of apple culture to prove of substantial assistance to cultivators.

Situation.

If possible, land well above the level of streams, but not so high as to be fully exposed to the prevailing winds, should be selected. Land that slopes gently to the south-west and is sufficiently sheltered is best, if other conditions are favourable, as land inclining in this direction does not receive the full rays of the sun in the early morning before the temperature has risen. Consequently, the blossoms of the trees are not so liable to suffer in frosty weather, as the temperature rises gradually before the full rays of the sun shine upon them.

Soil and its Preparation.

Land that will grow good wheat will grow good apples. Very light sandy soil should be avoided, as should also heavy clays. It is most important that the land should be free from weeds previous to planting the trees, as it is impossible to clean it after they are planted. If necessary it should be drained, but this point can be decided by digging trial holes 3 ft. deep in various places. After a good rain the holes should be inspected. If water is in them the land must be drained, but if they are practically dry draining will not be necesary. If draining is to be done, 2-in. drains should be laid, making them about 2 ft. deep. Very deep drains are not so effectual in carrying the surface water from heavy land. The lateral drains should be formed across the slope, if possible, terminating in a main drain of 3-in. pipes for an area of not more than four acres. If a larger area is to be drained, the main towards the lower part should be of pipes proportionately larger. The distance between the lateral drains should vary according to the texture of the land, but two lineal rods is a very convenient distance, and is generally effectual. The drains should, if possible, be so arranged that they are between the rows of the trees, and they should all be perfectly straight. The lines of the main should be determined by slight angles if necessary. Curves must be avoided.

Having drained the land, the next step is to manure and cultivate it. It is a mistake to make the land too rich for young trees. They are not capable of taking up large quantities of plant food, and, moreover, if the land is too heavily manured, they develop soft and coarse wood which ripens imperfectly. Soil that will produce good crops of cereals will grow apples well if a moderate dressing of manure is applied for the young trees, followed by additional supplies when they are carrying heavy crops of fruit. The land should be cultivated to a depth of at least 18 in., either by trenching or by steam scarifying. The latter is by far the cheaper method for large areas.

Protecting the Trees.

Hedges of damsons may be planted around the area to protect the trees from the wind, but if the land is of a heavy nature, black Italian poplars may be substituted for the damsons.

The poplars should be cut in close and topped every year thus forming a very stiff wind screen. In very exposed places a double row of Scotch or Austrian firs will be found effectual, but will require more room than the former. If standards only are to be planted, wire netting may be placed around each of the trees to protect them from rabbits, but if a mixed plantation is to be formed it will be preferable to enclose the whole area with it.

Selecting the Trees.

The trees should be selected during the latter end of summer. The ordinary standard, with a 5 ft. to 6 ft. stem, is the most suitable if the land is eventually to be used for grazing purposes; but low or bush trees can be planted more thickly and give quicker returns. If possible, the intending purchaser should visit the nursery and inspect the trees previous to purchasing, thus avoiding, to some extent, the risk of getting unsatisfactory trees. No hard and fast line can be laid down as to the exact sorts to plant in various localities, but great care must be exercised to get the trees on suitable stocks. The crab is the most suitable, generally, for standard trees, and the Doucin or broad-leaved Paradise for bush trees; but the very free-bearing kinds, such as Lane's Prince Albert, do well as bush trees on the crab. The stock should have been raised by layering for the standards and from layers or cuttings for the bush trees.

Types of Trees.

There are two forms of trees, viz., the standard and the bush, that are generally used for orchard planting, either separately or together. The bush trees give quicker returns and produce finer fruit than the standards, while the latter last longer and, in favourable seasons, produce large crops of medium-sized fruit. To form an orchard that will serve the double purpose, viz., give quick returns and last for a long period, it will be advisable to plant standards with bushes between. Standards may be planted 27 ft. or 36 ft. apart, with bush trees between, 9 ft. or 12 ft apart. The distance between the trees must be regulated by the space required according to their habit of growth. The bushes will commence to bear the second season after planting, and may be expected to produce good crops until the standards

grow them out; whilst the standards will not fruit so quickly, but will in time produce large crops of useful fruit. With foreign supplies of such excellent quality and appearance, increasing in quantity year by year, it is advisable for the British grower to produce the finest fruit possible. The average quality of the past will not withstand the present keen competition, and, as the bush trees can be planted more closely, give quicker returns and produce fruit of finer quality and appearance than the average standard, the planter will do well to consider his line of action before purchasing. The matter may be briefly summed up as follows:—Standards give but small returns the first few years, but last a long time if properly managed, and, in favourable seasons, yield good crops of fruit, but the crops are often severely reduced by wind. Bush trees give quick returns. The fruit is generally clean, good in quality and appearance, and larger than those of similar kinds grown on standards. If grown amongst the standards, they should last until the latter grow them out; if by themselves, for a period of from twelve to twenty years. Standards and bush trees mixed give crops extending over a long period, the heaviest early crops coming from the bush trees, and a long continuous supply from the standards when once they are brought into a fruit-bearing state.

Kinds to Plant.

COOKING.

STANDARDS.	BUSHES.
Beauty of Kent.	Bramley's Seedling.
Bramley's Seedling.	Ecklinville.
Gascoigne's Seedling.	Golden Noble.
Grenadier.	Lane's Prince Albert.
Lord Derby.	Pott's Seedling.
Lord Grosvenor.	Sandringham.
Newton Wonder.	Stirling Castle.
Wellington.	Warner's King.

DESSERT.

Adam's Pearmain.	Adam's Pearmain.
Blenheim Orange (slow to come into bearing).	Allington's Pippin.
Christmas Pearmain.	Beauty of Bath.
Devonshire Quarrenden.	Christmas Pearmain.
Fearn's Pippin.	Cox's Orange Pippin.
King of Pippins.	Lady Sudely.
Ribston Pippin.	King of Pippins.
Worcester Pearmain.	Worcester Pearmain.

Planting.

October, or early in November, is considered the best time for planting, but the trees should not be removed from the

nursery quarters until the ground has been well soaked with rain, or the roots may be materially damaged. To define the position of the trees various methods have from time to time been advocated, many of them taking up a considerable amount of valuable time. All methods aim at one common end, viz., to get the trees into their proper position, and it is an accepted rule that all newly-planted trees need staking. If a straight line is taken along one side of the proposed orchard, and another opposite, quite parallel, and one at each end at right angles, the four sides are defined. A stout, whitened stake should be placed at each corner. Stakes for sighting should then be placed at the distances apart that the trees are to be planted all along the four sides in straight lines. Three men should be employed, one directing from one of the base lines, another from one of the lines at right angles, the third to place the stakes to define the positions of the trees. If stakes suitable for the trees are used for this work, they may be driven into the ground firmly, and the holes dug around them for the trees. This method will avoid any further measurement or sighting. If standards are to be mixed with bush trees, care must be taken to place longer stakes at the proper places.

The holes should be dug shallow and broad. Any damaged roots of the trees should be carefully pruned from the under side before planting. The trees should be so planted that the roots are just below the surface of the soil. On land inclined to be wet, the roots may be slightly above the ordinary ground level in shallow moulds of earth. Secure the trees to the stakes, taking care to use straw bands to keep the trees secure yet quite clear from them, so that they do not get their bark chafed. The trees should then be mulched with short manure. This mulching should cover a space equal to the original size of the hole before the trees were planted.

Pruning.

This matter needs careful consideration and much study to procure good results. Many people profess to thoroughly understand the work, but it is doubtful if anyone is really master of the art. Those who have studied the matter carefully are generally agreed that they are not yet decided upon

various points. It is quite certain that the aim of the industrious grower will be to secure good crops, and in order to achieve that end he must be master of the trees, and not the trees master of him—as is too often the case.

Assuming that the trees were planted in autumn, they should be pruned the following February. The method of procedure may be as follows:—First thin out the weak, twiggy growths other than fruiting spurs (if any). Next shorten back the leaders, *i.e.*, the main growths. The weak leaders may be cut back to a point leaving about 4 in. of last year's growth, and the stronger growths at lengths varying according to their strength up to 8 in., varying the length of the leaders left, after shortening back, according to their strength of growth. If the trees are erect growers, they should be pruned to wood buds, pointing outwards (wood buds are pointed and fruit buds are larger and rounder). If they are of a drooping habit they should be pruned to wood buds pointing upwards. About the latter end of July the young trees should have their lateral growths cut back, leaving them about 2 in. long. Any that are wanted as leaders to grow in large openings, to make the trees a good, serviceable shape, may be left. Those laterals that were cut back in July should be cut back again about the second week in September, making the September cut behind, or nearer to the leader, than the July cut. The July pruning will probably cause fruit buds to form, but, if not, the September pruning will. It is very important that this last summer pruning should be done at the right time. If done too early, another set of sub-laterals will develop; and if done too late, when the leaves have fallen and the trees are void of sap, no good will result from the work, because there will be no sap for the formation of the desired fruit buds.

The following February the leaders should be shortened back again. If they have developed a good supply of laterals the previous summer they should not be cut back so close as at the first shortening; but if they have not developed laterals freely, if their back buds are blind and dormant, they must be cut back harder than they were the first year. The second summer pruning should be the same as for the first season. The winter and summer pruning for the third year should be the

same as for the second. The standards should by this time have formed good open heads, with their boughs well set out, and fairly stiff and rigid at the base. These boughs will in time develop into large ones, and, therefore, their careful manipulation and distribution, when young, is of more importance than is generally recognised. Subsequent pruning will be made to remove useless and unnecessary wood.

The pruning of the bush trees will continue in a similar manner, except that as the trees advance more length of the leaders may be left if they can properly develop their laterals. As the trees get larger, laterals should be allowed to grow as leaders where space permits. The trees should be encouraged to grow to a uniform height of 10 or 12 ft., keeping them as even as may be at the top, so that the wind may sweep along over them without moving the fruit-laden boughs to any great extent.

About five years after planting the roots should be pruned if the trees grow strong. This should be done by digging a trench around the tree in October or November, and removing the earth so as to afford access to the roots. These should then be shortened back, *entering the knife on the under side*, leaving them when pruned half as long as the average length of the boughs—not counting the young growth of the current year. The hole should then be re-filled, the tree mulched and staked. The second summer afterwards a good crop of fruit should be the result, and with proper care and attention the trees will go on fruiting year after year.

Manuring.

Sufficient plant food or manure should be applied to the trees to keep them in a healthy but not too vigorous state of growth. If they have a tendency to grow strong, manure must be withheld, but if they carry heavy crops of fruit it is quite evident that the supply of plant food taken from the land by the trees must be replenished or failure will ultimately ensue. If necessary a liberal dressing of farm-yard manure may be applied each winter, previous to cultivation, between the trees. The manure should extend as far from the stems as the boughs are long. Superphosphate and kainit are

valuable plant foods for the apple, and may with safety be applied at the rate of from 3 to 5 cwt. each per acre, in addition to the farm-yard manure, if necessary. The amount applied must be regulated by the growth of the trees and the crops they produce.

Washing.

The trees must be washed in the spring, when the caterpillars resulting from the winter moth* appear, which is usually about the time the trees are in flower. Older trees, infested with lichen, &c., affording protection for many pests in embryo during winter, may be washed in February with a mixture made of

1 lb. caustic soda
1 lb. crude potash
¾ lb. soft soap
10 galls. water.

Sufficient whitening may be added to the wash at the time of spraying to define where the wash has actually been applied. This will ensure the whole of the trees being dressed.

Renovation of Old Trees.

The renovation of old-established standard trees is well worth close attention if they are good kinds. If the sorts are not of the best the trees may he headed down and good saleable kinds grafted on to them. Bramley's Seedling and Stone's will prove useful cooking kinds for grafting on old trees of discarded varieties, while for dessert Allington Pippin and Worcester Pearmain may be used. If the trees are of good kinds, but impoverished, a good dressing of farm-yard manure, together with superphosphate and kainit, should be applied early in the autumn, and should be well dug in if the land is arable. If the land has been laid down to grass the same manures may be applied as a top dressing, but their action will not be so apparent as on cultivated land.

All useless boughs, particularly those growing crossways in

* The methods of prevention and the washes recommended for use against the caterpillars of the winter moth are given in the Board's Leaflet No. 4, and among the other pests of apple trees dealt with in separate leaflets are Apple Blossom Weevil (No. 15); Apple Sucker (No. 16); Codling Moth (No. 30); Woolly Aphis (No 34); Canker Fungus (No. 56); Mussel Scale (No. 107); Fruit Tree Beetle (No. 49); Tent Caterpillars (No. 69); Brown Rot of Fruit (No. 86); Fungus Disease (No. 87); The Pith Moth (No. 90). Information as to winter washing of fruit trees is given in Leaflet No. 70.

the trees, should be removed. When the thinning process is completed there should be room for a man to move freely between the main boughs. The trees should be thoroughly sprayed in February with the caustic winter dressing previously advised.

*Packing and Grading the Fruit.**

The fruit of the early kinds should be picked before they are quite ripe. They are not so liable to bruise in transit then as when quite ripe, and, moreover, they will ripen quickly when enclosed in the packages on the way from the grower to their destination ; whereas, if allowed to become quite ripe, they would be more soft, and would bruise far more freely in transit. The later kinds, that are to be stored, should be allowed to mature, or they will shrivel after they are picked.

The fruit is generally packed in bushel and half-bushel baskets, while some of the more up-to-date growers use small barrels. These are better than baskets, as the insides being smooth, the fruit does not bruise so freely. For the choicer dessert kinds light boxes may be used, in which case the lids should be fixed and placed downwards. The fruit should then be placed evenly upon what is then the lower part of the box, finishing at the top — which, when the remaining wood is nailed on and the box reversed, proves to be the bottom. The lid, which was originally the bottom of the box, is then at the top, and when removed exposes the carefully placed fruit to the eye of the purchaser. The boxes should be properly branded at the ends.

All fruit when packed should be carefully graded and sorted, so that only those of an even, uniform size are packed together. At least two sizes should be made from each bulk. Mixed fruit of various sizes is practically unsaleable, more particularly as the foreign supplies are so very carefully sorted as to size.

Storing.

For preserving late kinds until selling time a suitable storehouse must be erected. Fruit will keep no better in elaborate expensive buildings than it will in an inexpensive building of

* Information as to the grading and packing of fruit and vegetables is given in Leaflet No. 98.

thatch and earth. A very suitable building may be made as follows:—

Place a row of posts, about 4 in. square, in a line, 2 ft. apart, say for a distance of 100 ft. Then place another row parallel, 12 ft. from the first, inside measurement. Let the posts be 5 ft. high from the ground line. Place boards along the outsides of the posts on either side and also at the ends, where suitable doors should be placed. Dig a ditch on each side of the posts, 3 to 4 ft. from them, and place the earth against the boards. This will prevent the frost from getting in at the sides. Suitable plates and rafters may then be put on to the two rows of posts, thus making a span-roof building. The top may then be thatched with reeds, straw, or heather. The ends should be double-boarded, and the cavities filled with sawdust. A ventilator should be placed in the apex at the ends. The floor line inside the house should be slightly above the outside ground level, and, if possible, the building should be erected on a gentle slope. The inside may be fitted with three rows of shelves or benches on either side.

An inexpensive store house may thus be erected, and the later kinds of fruit stored until selling time. Free ventilation should be afforded for a period of six weeks after picking the fruits to allow the moisture to exude from them. Afterwards the store house may be kept closed, maintaining an average temperature of from 38 to 42 deg. Fahr., as near as possible, but sudden changes in the outside temperature will naturally have some influence upon that inside the fruit store.

W. GOARING.

DAY-OLD CHICKENS.

Many developments have taken place within recent years in the poultry industry, which has grown enormously, not only in respect to the production of eggs and table poultry, but in various other directions, all of which add to the returns obtained by poultry breeders and increase the production. Not the least of these is the sale of day-old chickens. Ten years ago it was almost unknown in this country, but with the

introduction of incubators and brooders a wide field of enterprise was opened, and it was found that there was a demand for chickens on the part of farmers and others.

The business is one which offers fair returns when carried out upon a sufficiently large scale. Skill in the management of breeding stock and incubators is necessary, together with considerable capital, constant attention, and a regular supply of fertile eggs from January to June. The first consideration is the number of incubators required to meet the demands of customers for chickens, and these involve considerable expenditure. Then comes the question of obtaining the eggs to fill them, and this requires a large flock of fowls or an organisation for securing supplies. For a plant with a capacity equal to the production of, say, 1,000 chickens per week from February to June, that is twenty weeks in all, at least 30,000 eggs will be required. Assuming an average of sixty eggs produced by each hen during that time, 600 head of stock would be needed to meet the demand, which number could not be managed without considerable labour and capital. The prime necessity is that the breeding stock shall be at liberty and not kept in confined areas, for it is an undoubted fact that eggs from hens highly bred, highly fed, or kept in confinement, do not hatch so well artificially as they would do under hens, and the chickens produced from eggs laid by them are less vigorous and do not travel so well as those produced from breeding stock treated in a more natural manner. Hence, if it is intended to produce all the eggs required, the flocks must not only be numerous but given natural conditions, and for this a large area of land is essential. Another plan is to distribute flocks of fowls among farmers in the district, from whom the eggs are obtained as required. This plan, whilst probably a little more expensive than the former, has decided advantages in that the fowls are well distributed, the requisite attention is in a greater number of hands, and there is not the same danger of increase beyond the capacity of the land ; in short, the work is divided, each partner in the scheme having a general interest in the successful issue of the enterprise, and those in charge of the hatching operations can concentrate their efforts upon that part of the work and on the business of selling and despatching the young chickens.

The question of free range for the stock may, however, be regarded as essential.

For the attainment of success it is necessary to be able to supply chickens of the breeds required by purchasers, and the demand varies in different districts. Eggs from cross-bred birds hatch out a larger percentage, and the chickens are hardier and travel better than pure-breds, but the prices obtained for crosses are never so high as those for pure-bred chickens. The cost in each case will be the same, and for these reasons the trade is chiefly in definite breeds. Where operations are upon a small scale one breed only need be kept, provided an adequate demand can be secured. But in large establishments several must be maintained, and of the classes most saleable. Chicks of the heavier breeds are said to stand the travelling better than those of the lighter varieties. Prices vary considerably in accordance with the time of year and the class of fowls. Chickens, for instance, which are intended to be used as breeding stock command higher rates than those intended for killing or for farmyard purposes. The fashionable varieties are always in demand to a greater extent, and sell at higher rates than utility breeds.

Experiments conducted upon the Reading College Poultry Farm, Theale, during the spring of 1904, showed that, assuming the cost per egg to be one penny, and allowing for 30 per cent. of fertile eggs not hatching, but without charging anything for interest upon capital or for labour, the actual expense of producing a chicken was 1·724d., or nearly 1¾d. Putting interest and labour at the same figure, though this would be increased or decreased according to the extent of the operations, the prime cost may be reckoned at 3s. 6d. per dozen. To that must be added the expense of a suitable box for packing the birds and conveyance to the nearest station. Hence chickens can scarcely be sold under 5s. per dozen. The profit will depend upon the returns, which vary from 5s. to 21s. per dozen.

The best age at which to despatch the chickens is when they are twenty-four hours old, or even a little earlier, that is, as soon as they have dried off and overcome the strain of hatching. If sent away too early they would feel the change and be liable to take a chill, which would be fatal. The experience

obtained at the Reading Poultry Farm has been that when chicks are hatched either by the hen or by the machine, it is better to leave them in the place of hatching for twenty-four to thirty hours before removal to coop or brooder, and the same is largely true when they are to be sent away. But it must not be too long delayed, for when once they begin to eat there must be a regular supply of food for them. Chicks two days old do not travel so well as twenty-four hours before, and every day after they feel the effects more rapidly. When sent off at the right age, in suitable boxes, they will travel long distances by land or sea quite safely, even when the journey occupies as much as thirty-six hours.

The best packages are light wooden boxes, with several ventilating holes near the top of the sides and in the lid, and fitted with a handle made of thick cord, or tied round with thick string. For a dozen chickens a box about 14 in. by 9 in. and 9 in. high is large enough; for two dozen, 15 in. square. The floor should be thickly covered with cut chaff, among which may be scattered some coarse oatmeal, dari, and canary seed, and the sides, more especially the corners, lined with soft hay. The lid is better if lined with coarse flannel tacked at the edges, but loose enough to hang down in the centre. If the journey is to be a long one, a lettuce or two may be hung where the birds can reach it. The box should be well made, and tied down, not nailed. There is much greater risk during very severe weather, more especially in cross-country journeys, when the danger is of exposure at open stations, and care should be taken to despatch them by fast trains making good connections, and if possible at night. But the sale of these birds is generally in the milder spring months, when the risk is not so great as it would be earlier in the season. Boxes should be prominently labelled "Live chickens—this side up," and experience has shown that railway officials take pleasure in expediting their transit.

Not the least important point is the treatment of chickens on arrival at their destination. Unless that is favourable, all the efforts of the vendor may be lost. It is to his interest to satisfy his customers by sending them hardy birds, but he has no means of controlling them when once they have left his charge,

and the responsibility rests with the purchaser. There is nothing better than placing the youngsters for an hour or two in a brooder heated to as near 100 degrees as possible, and in the absence of such an appliance, excellent results have been obtained by putting them into an oven, in a flannel-lined basket, leaving the door open, not higher than the temperature named; or it will be enough if the basket is placed near the kitchen fire. Then they should be given a good feed of warm steeped oatmeal or biscuit meal, and have a little warm milk to drink. If broody hens are available, the best results will be obtained by rearing the chickens under them, if they have travelled a considerable distance. One or two should be given to her first in order to see if she takes to them kindly, and then the rest may be slipped under her wings. Where rearers are to be employed, and small, inexpensive appliances are now sold, these must be well warmed up, say, to 95 degrees F., and the chicks placed therein. Around or in these brooders, according to the class, is littered cut chaff, among which is scattered what is known as the dry feed, and in an hour or two the birds will, if permitted, begin to scratch and seek for food as if they had known nothing of the delights of travel, but had been born a few yards away.

EDWARD BROWN.

INJURIOUS AND BENEFICIAL SLUGS AND SNAILS.

I.

Slugs and snails cause every year a very considerable loss to the farmer and gardener; we also find slugs now and again doing damage to stores, &c., indoors, notably to wine corks. During the last four years there has been a great increase in the number of slugs all over Britain; so much so that during the last two years whole fields of wheat, cabbage, and other plants have been stripped by them. In gardens during the past season it has frequently been impossible to get a crop of early peas or beans, whilst the young potato sprouts were often eaten right down. Snails are also frequently destructive, but have not increased in the same rapid manner as slugs.

The common field slugs are practically omnivorous, but others prefer certain kinds of food, though they will devour almost anything under stress of circumstances. Unlike a snail, a slug has no external shell, except in one genus (*Testacella*); the shell is present, however, as a small flat plate, sometimes almost only a mass of granules, hidden just under the skin. Their soft

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The common field slugs are practically omnivorous, but others prefer certain kinds of food, though they will devour almost anything under stress of circumstances. Unlike a snail, a slug has no external shell, except in one genus (*Testacella*); the shell is present, however, as a small flat plate, sometimes almost only a mass of granules, hidden just under the skin. Their soft body is extremely contractile, and the moist skin is provided with numerous glands which secrete a slime which can be passed out very copiously for a short time. The slime glands soon get exhausted, and take some time to regain their energy. The slug has a distinct head with contractile tentacles, upon the ex-

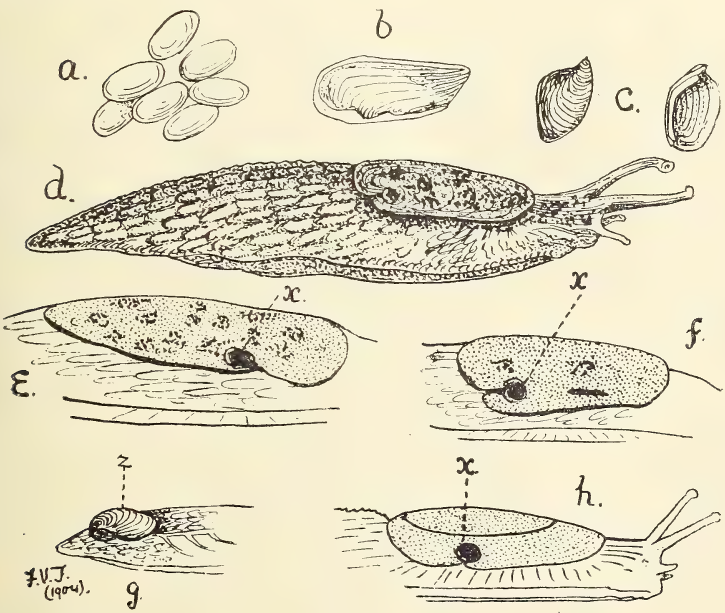

FIG. 1.—CHARACTERS OF SLUGS.—*a.* Eggs; *b.* Shell of Slug (*Limax*); *c.* Shells of Testacella; *d.* Grey Field Slug (*Limax agrestis*); *e.* Shield showing respiratory pore (x) of an *Arion*; *f.* of a *Limax*; *g.* Tail end of a Testacella showing shell (z); *h.* Shield showing respiratory pore (x) of *Milax*.

tremities of which are placed the eyes. The mouth, as in the snail, is provided with fleshy lips, and within is placed a long, ribbon-like body, called the radula. This radula is provided with transverse rows of teeth, which differ in form and arrangement in different mollusca. It is by means of this structure,

which acts as a rasping organ, that slugs and snails devour the tissues of plants and other substances. Both the slug and snail crawl upon a flattened portion of the body called the foot, which, in the shell-bearing snail, can be retracted completely into the shell. They breathe by means of the air coming in contact with the highly vascular walls of a space in the body known as the " mantle cavity."

In both we find the male and female sexual organs in the same individual—that is, they are hermaphrodite animals. They do not, however, perform the act of self-fertilisation, except under exceptional circumstances. Both slugs and snails copulate, the male and female sexual products ripening at different times in the same individual. Both these molluscs deposit eggs, which are large and very numerous.

The slugs place their ova separately under the soil ; snails usually in batches in slanting galleries in the earth, which are formed by the parent snail. The eggs are round or oval, milky white, semi-transparent bodies, and may be found under stones, in damp moss, under boxes or any substances lying about upon the ground, as well as in the earth.

The slugs belong to the family *Limacidæ* and the injurious species to the three genera known as *Arion*, *Limax*, and *Milax*. The first is distinguished by having a slime gland at the posterior end of the body, and by having the respiratory opening in front of the area over the rudimentary shell (the shield). In *Limax*, the respiratory opening is at the back end of the shield (Fig. 1, *f. x.*). In *Milax* it is on the right side behind the centre of the mantle, and the body is acutely keeled along the back (Fig. 1, *h. x.*).

The snails that are injurious belong to the family *Helicidæ* and to the genus *Helix*. Both slugs and snails are chiefly crepuscular, or nocturnal, but many kinds will feed ravenously in the daytime if the weather is damp, especially after heavy rains or showers. Snails mostly shelter under leaves, stones, and in moss during hot days ; most slugs prefer the earth for protection. All snails seem to prefer green vegetation for food, but several slugs have a decided objection to green plants and feed almost exclusively on non-chlorophyllaceous matter, some preferring dried vegetal products, others living on dead animal substances.

The following are the most important destructive British slugs :—

(1) THE GREY FIELD SLUG (*Limax agrestis.* Linn.).

This is by far the most injurious species, and is accountable for an enormous amount of damage. It may be found not only in nearly every garden and field in this country and in Europe, but also in Siberia, Algeria, and Madeira. It is one of the

FIG. 2.—Grey Field Slugs (*x*) feeding upon Runner Bean.

most prolific of its race, a single specimen being capable of laying as many as 500 eggs during the year. As a rule they deposit them in small batches of from six to fifteen, but separate from one another. The breeding season is from May into November. During the whole of this period the eggs may be found either in the ground, under stones, &c., or amongst moss. The ova take three or four weeks to develop. Moisture is

necessary for them to incubate, but they can at times resist long periods of drought. When first hatched, the young are about one-twelfth of an inch long, and are then very pale and soft. Some have been found to reach sexual maturity in four months, but as a rule they take much longer, probably nearer a year.

The mature grey slug has an elongated, spindle-shaped body, usually of a mottled, ashy-grey colour, but sometimes with a dull reddish or yellowish tinge. In the spring it is often paler than later in the year. The foot has pale sides. The hidden shell is oval and concave on its under surface, very thin, and marked with concentric lines of growth, and the edge is bordered with a broad, membranous, striated margin. When full grown this slug may reach an inch and a-half long.

Like all slugs, its life is dependent on moisture. During hot and dry weather they contract and roll up, hiding away under stones, in crevices in the earth, &c., but come out at night to feed. In winter, if the weather is open, they will continue to feed, but in cold weather they become semi-torpid and hide away in large numbers under stones, decaying logs, rubbish, &c., and also in the earth. Attacks of this slug can frequently be traced to neighbouring woods and shrubberies and rubbish heaps.

Vegetation of all kinds is devoured by these slugs, but they prefer to feed above ground. They sometimes cause wholesale destruction to wheat, clover, turnips, cabbage, and rape, the young turnips being eaten off just above the ground; recently much harm has been done in hop-gardens,* and almost all garden plants, both culinary and ornamental, are attacked by them.

(2) THE BLACK-STRIPED OR MOTTLED SLUG (*Limax maximus.* Linn.).

This large slug is said by Simroth † and by Scharff ‡ to feed almost exclusively on non-chlorophyllaceous matter. This does not agree with my own observations, for I have frequently found it devouring whole boxes of seedling plants, and, in

* *Second Report on Economic Zoology*, p. 55 (1903). F. V. Theobald.
† *Zeit. Wiss. Zool.*, p. 203, xlii.
‡ *Scient. Trans. Roy. Dublin Soc.*, IV. (2), p. 520.

greenhouses, stripping everything within reach. It is one of the largest slugs, often reaching seven inches in length. It is very variable in colour, sometimes black, or yellowish-grey mottled with black and white; the body is covered with tubercles, and the flat foot is edged with white. It is not a prolific species. The eggs are large and laid in little clusters, and are slightly attached together with slime. They have been found under logs and sacks and in the loose earth on marrow-beds both in late summer and in autumn. In four weeks, young slugs come from them and soon commence to feed. This large slug, which lives for several years, excretes a quantity of opaque white slime which becomes very iridescent when dry. This species also feeds upon animal matter; specimens have frequently been seen to feed off raw beef *; they also devour one another and one another's slime,† and they have also been found feeding upon fungi growing on rotten wooden seedling boxes in gardens.

(3). THE HOUSEHOLD SLUG (*Limax flavus.* Linn.).

This is the slug commonly met with in cellars, sculleries, &c., in houses, and it also occurs in damp woods and gardens. It can travel great distances: one was observed to crawl up twenty feet of wall in the night and enter a room, where it left behind a trail of slime thirty feet long on the carpet, and was found in the morning still crawling up to a window. It feeds upon a great variety of substances, especially meal and flour. It is particularly partial to cream, and may also be found feeding on the fungi that grow on beer drippings in cellars. Wine corks are often eaten by it. Bread, cooked vegetables, and meat are also attacked. In colour it is dull yellowish, sometimes speckled with white and black, and covered with coarse oval tubercles; the head and tentacles are bluish; the foot is margined with yellowish-white, and the sole milk-white. In length it may reach four inches. The slime is very copious, yellowish in colour, and iridescent, staining objects over which it crawls yellow. It is almost exclusively nocturnal, and may be met with in most parts of Britain.

* *The Zoologist*, XIX., p. 7,819.
† *The Naturalist*, p. 55, 1889.

(4) THE ROOT-EATING SLUG (*Milax sowerbii.* F. and H.).

This is the garden pest that does so much harm to bulbs, tubers, and roots of all kinds. It is gregarious, and passes the day under the ground, especially at the roots of plants, coming up at night to feed upon leaves. Like the earthworm, it pulls plants into its underground abodes and feeds upon them during the daytime. Small lilies, iris, &c., are especially attacked, the long leaves being bent over and pulled into the soil. Besides plants, it has been known to feed upon the caterpillars of moths, and will attack earthworms and smaller slugs. The damage it does in the garden is very great, to both culinary and ornamental plants. It is particularly fond of potatoes and carrots. The body is prominently and acutely keeled all along the back, and the shield has the respiratory orifice on the right side behind the centre of the mantle, while the reproductive orifice is midway between the base of the right tentacle and the respiratory orifice. The skin is thick, and the colour varies from pure white, through yellow, grey, and brown to almost uniform black. It is found generally distributed throughout England, Wales, the south of Scotland, and Ireland. It is also known as *Amalia carinata.*

(5) THE LARGE BLACK SLUG (*Arion ater.* Linn.).

This slug will feed upon almost anything—the choicest garden vegetables and flowers, coarser field crops, other slugs, various insect larvæ, earthworms, raw meat, and it has been known to devour newspaper and sand, and even soap.* It is found in damp woods, along dykes, in gardens and hedges, but not so often in open fields. During daylight it hides away under logs, stones, boxes, sacks, &c., and tunnels into the ground. At night or after rain it comes out and soon begins to feed. It varies in colour, but is usually black, though it may be dull green, brown, dull yellow, or dusky red, covered with large tubercles. The foot has a yellowish-white border; the mantle is paler than the rest of the body, and the tentacles swollen apically. The slime is of a yellowish colour. Observations on its reproduction have been made by Mr. F. W. Wotton,†

* *The Naturalist*, p. 103, 1889.
† *Journal of Conchology*, VII., p. 158, 1893.

according to whom the eggs are laid in batches, as many as 477 being deposited by one slug. "While depositing the eggs," says Mr. Wotton, "the slug remained throughout in the same position on the surface of the ground, with the head drawn up underneath the mantle, which was lifted just above the reproductive orifice. After it had finished laying it ate half a raw potato and then took a bath, remaining submerged for more than an hour."

The eggs are oval, opaque bodies, and take about thirty to forty days to hatch. The young slug buries itself at once in the earth. It is at first 9 mm. long, about 56 mm. at the end of five months, while full growth is attained about the middle of the second year. Death occurs usually at the end of the second or beginning of the third year. The shell consists of small, separate grains of very unequal size.

(6) THE SMALL ARION (*Arion hortensis.* Fer.).

This is a small slug, not more than an inch and a-half long. It is very variable in colour; brown, grey, dull yellow, green, or black forms may occur, nearly always distinctly marked on the back and sides with long bands or stripes, and covered with coarse, oblong tubercles. The shield has a dark stripe down the middle, and one on each side. The foot has a narrow border of grey, red or orange. This common slug does a great deal of harm, and occurs in gardens and fields, hiding under stones and fallen leaves wherever it is damp. The eggs take from twenty to forty days to mature, and the slugs reach their full growth at the end of their first year.

(7) EARTHWORM-EATING SNAIL-SLUG (*Testacella haliotidea*).

This slug, which sometimes reaches three inches in length, is found in gardens and at the bottom of flower-pots and boxes, and in heaps of leaf mould. This and two other species hunt for earthworms in their burrows and devour them wholesale, and also feed on snails and slugs. They do no harm to vegetation, and should be protected and not destroyed. The radula has very long teeth, and there is a distinct external shell, so that they come between the snails and slugs. They take four

or five years to reach maturity. The eggs are laid separately and resemble hens' eggs in shape, and have a very thick skin. Usually only six or seven are laid at a time. These beneficial slugs can at once be recognised by the external shell.

F. V. THEOBALD.

IMPORTS OF AGRICULTURAL PRODUCE IN 1904.

The following tables, which have been compiled from the Trade and Navigation Accounts, show the quantities and value of the principal articles of agricultural produce imported into the United Kingdom during the past year.

The imports of cattle in 1904 reached a higher number than in any year since 1898, and there was also some recovery in the number of sheep. The two countries from which our supplies of live animals are at present mainly derived are the United States and Canada, though a small number of cattle come from the Channel Islands, and sheep are also received from Iceland. The past year saw a substantial increase in the imports of cattle from the United States, but this was to some extent counterbalanced by smaller receipts from Canada. Comparison with the year 1903 is, however, somewhat vitiated by the fact that in that year, owing to the closing, in consequence of foot-and-mouth disease, of some of the United States ports, a proportion of States cattle came to this country through Canada. The receipts from United States ports in 1904 numbered 401,000, and exceeded the totals both for 1902 and 1903, whilst those from Canadian ports (146,600) were greater than in any previous year with the exception of 1903. The total weight of beef represented by these imports on the hoof may be estimated approximately at 3,576,000 cwt. The imports of fresh beef were also characterised by a rise in 1904, but in this case the country contributing to the increased supply was not the United States but Argentina, which sent us 1,675,000 cwt., compared with 1,152,000 cwt. in 1903. The extension of the fresh meat trade with Argentina has, it may be noted, been very rapid during the past few years, the cattle which were formerly exported for slaughter on arrival at British ports being now killed and exported to this country as refrigerated meat. The declared value of the fresh beef imported was 37s. per cwt., as compared with 40s. 3d. in 1903, and 42s. 8d.

in 1902. Live cattle, on the other hand, showed a small rise from £17 12s. 5d. in 1903 to £17 14s. 4d. per head in 1904.

The imports of live sheep, which had declined in 1902 and 1903, regained the level at which they stood in 1900 and 1901, but it will be seen from the table that there was some falling off in the imports of fresh mutton, chiefly due to the fact that the exceptional supplies from New Zealand in 1903 were not maintained.

The declared value of the sheep was 31s., or 2d. more than in the preceding year, while fresh mutton averaged 39s. 3d. per cwt. compared with 39s. 0d., in 1903.

TABLE I.

Imports of Live and Dead Meat.

Description.	Quantities.		Values.	
	1903.	1904.	1903.	1904.
	No.	No.	£	£
Cattle	522,546	549,532	9,209,122	9,736,436
Sheep	354,241	382,240	546,063	591,984
Total Live Animals...	—	—	9,755,185	10,328,420
	Cwt.	Cwt.		
Beef, Fresh	4,159,606	4,367,322	8,366,141	8,080,257
„ Salted	173,692	144,304	245,605	187,288
Mutton, Fresh	4,016,622	3,494,782	7,826,062	6,861,531
Pork	705,844	610,485	1,555,452	1,378,467
„ Salted	237,574	243,842	319,256	294,080
Bacon	5,156,988	5,452,311	13,619,140	12,832,142
Hams	1,141,332	1,244,013	3,142,574	3,104,999
Meat, Unenumerated, Salted, or Fresh ...	663,261	631,012	1,206,052	1,164,012
Meat, Preserved ...	767,563	814,398	2,435,777	2,461,841
Rabbits (dead)... ...	475,645	533,698	723,881	780,737
Total Dead Meat ...	17,498,127	17,536,167	39,439,940	37,145,354

The next item in the above table to attract attention is bacon, the imports of which were about 300,000 cwt. more than in 1903, though still below the totals of the years 1898 to 1901. Among the countries contributing to our supply of this form of pig-meat, the United States claims pre-eminence with 2,806,000 cwt., Denmark taking the second place with 1,724,000 cwt., an extension of a quarter of a million cwt. since last year. Canadian bacon was received to the amount of 830,000 cwt. A comparison of the values in the two years shows that there was

a distinct drop in prices in 1904, the average of the year being 47s. 1d., per cwt., as against 52s. 10d., in 1903.

Converting the live animals into their equivalent weight of meat, and adding the total imports of dead meat of all kinds, it appears that this country consumed, in addition to the home supply, some 21,321,000 cwt. in 1904, compared with 21,061,000 cwt. in the preceding year. The lower values, however, enabled this somewhat larger supply to be imported for a sum of £47,474,000, as against £49,195,000, which was the total value credited to these various kinds of meat in 1903.

TABLE II.

Imports of Dairy Produce, Margarine, and Eggs.

Description.	Quantities.		Values.	
	1903.	1904.	1903.	1904.
	Cwt.	Cwt.	£	£
Butter	4,060,694	4,241,005	20,798,707	21,117,162
Margarine	882,123	960,278	2,313,618	2,494,467
Cheese	2,694,358	2,554,298	7,054,710	5,843,773
Milk, Condensed ...	915,717	904,919	1,738,931	1,607,646
Milk and Cream, Fresh	22,487	—	40,176	—
	Gt. Hundreds.	Gt. Hundreds.		
Eggs	18,848,897	19,942,594	6,617,599	6,730,574

From Table II., which gives particulars of the supplies of dairy produce, it will be seen that the year 1904 was marked by a further increase in the quantity of butter, the imports of which exceeded those of any previous year. The noticeable feature which the returns reveal, however, is that while all the European countries, viz., Russia, Sweden, Denmark, Holland and France, whence our main supplies are derived, show a decline, the Colonial imports from New Zealand, Australia and Canada show a substantial growth. The average value of the imported butter declined from £5 2s. 5d. to £4 19s. 7d. per cwt., and of Danish butter, which is one of the highest priced butters imported to these shores, from £5 8s. 1d. to £5 5s. 5d. per cwt.

Canada is now the main exporter of cheese to the home country, and from that source we received 1,900,500 cwt. out of a total 2,554,000 cwt. The rise in the average declared value of imported cheese, which has been noticeable for several previous years was checked, and a fall has to be recorded from

52s. 4d. per cwt., the value in 1903, to 45s. 9d. in the year which has just closed.

The number of eggs received was somewhat greater than in 1903, but the increase was small compared with that in several previous years. Russia, the largest exporter of eggs to the United Kingdom, increased her contribution from 6,803,000 great hundreds to 7,033,000 great hundreds. Denmark, on the other hand, showed a decline from 3,852,000 great hundreds to 3,602,000 great hundreds. Germany, Belgium and France, however, increased their supplies.

TABLE III.

Imports of Horses, Poultry, and Miscellaneous Animal Products

Description.	Quantities.		Values.	
	1903.	1904.	1903.	1904.
			£	£
Horses ... ... No.	27,266	18,491	631,255	457,828
Poultry and Game £	—	—	1,202,288	1,217,176
Lard ... ... cwt.	1,732,790	1,830,837	3,870,774	3,342,395
Tallow and Stearine ,,	1,395,174	1,758,074	1,987,892	2,249,445
Wool, Sheep, Lambs lb.	599,500,932	561,706,689	20,622,523	20,366,930
Sheepskins, undressed No.	17,084,812	15,081,814	1,736,805	1,577,402
Hides* ... ... cwt.	493,748	449,625	1,229,727	1,106,454

* Does not include dry hides.

There has been a considerable drop in the imports of horses in recent years, as many as 51,786 being received in 1900 Since then the number has been steadily declining and only reached 18,491 in 1904, a figure lower than in any year since 1893.

Wool again shows a decrease, chiefly attributable to a falling off of 20 million lb. in the receipts from the River Plate and of 21 million lb. from New Zealand. The re-exports declined from 284,572,000 lb. to 251,715,000 lb. so that the balance of foreign wool remaining for manufacture in this country only diminished by about 5 million lb. The average value of the imports was nearly 8¾d. per lb. as compared with 8¼d. in 1903 and 7½d. per lb. in 1902.

Turning to Table IV., which shows the imports of grain and flour, a substantial increase is observable in the receipts of wheat-grain, accompanied by a reduction in the imports of flour. Taken together they were equivalent to 118,262,000 cwt. of wheat, which is one and a half million cwt. more than

in 1903, but at the same time a smaller increase than has been recorded for several years past. The total value amounted to £41,536,000, the largest sum since 1883. The changes which have taken place in our sources of supply have been previously referred to in this *Journal*, but it may be stated briefly that the striking feature of the year was the small importation from the United States, which only amounted to 6,091,000 cwt., whereas in 1903 the returns showed an importation of 24,198,000 cwt., and in 1902 of 43,313,000 cwt. The countries which have supplied the needs of this country during the past year have been India (25,485,000 cwt.), Russia (23,529,500 cwt.), Argentina (21,440,400 cwt.), Australia and New Zealand (10,630,700 cwt.), and Canada (6,195,300 cwt.). The decline in the receipts of flour referred to above was due to a drop in the supply of American flour from 16,223,000 cwt. in 1903 to 8,252,600 cwt. in 1904.

TABLE IV.
Imports of Grain and Flour.

Description.	Quantities.		Values.	
	1903.	1904.	1903.	1904.
	Cwt.	Cwt.	£	£
Wheat	88,131,030	97,813,600	29,940,191	34,237,689
Wheat Meal and Flour	20,601,448	14,722,893	9,723,652	7,258,606
Barley	26,555,867	27,152,320	7,221,789	7,161,600
Oats	16,283,763	14,097,900	4,263,950	3,729,677
Oatmeal	728,973	648,745	537,415	456,703
Maize	50,099,328	42,898,780	12,465,583	10,247,214
Maize Meal	590,416	316,660	176,622	100,940
Peas	1,829,923	2,179,456	690,768	767,029
Beans	1,765,700	1,862,734	594,833	577,094
Other Corn and Meal ...	1,824,574	1,660,434	576,503	513,844
Total	——	——	66,191,305	65,090,396

There was a slight increase in the importation of barley, but a decrease in the case of oats of 2,186,000 cwt., which brought this cereal to a lower figure than in any year since 1893. Taking these two grains together, Russia contributed 46 per cent. of the total supply from abroad.

Maize was imported from the Argentine Republic to the extent of 23,266,000 cwt., being the largest recorded exports to this country from the River Plate; but this did not suffice to make up for the falling off in the supply from the United

States, which only sent 8,077,000 cwt., in comparison with 18,676,000 cwt. in 1903. On a previous occasion, in 1902, when the United States exports fell to a very low figure, the deficiency was largely made up from Roumania; but owing to the drought in 1904 the export of maize from that country was prohibited in August, and the receipts were only equal to those of 1903, when the American exports were comparatively large.

TABLE V.

Miscellaneous Imports.

Description.	Quantities.		Values.	
	1903.	1904.	1903.	1904.
			£	£
Onions ... ... bush.	8,619,919	8,291,814	1,003,016	1,076,413
Potatoes... ... cwt.	9,150,202	10,003,267	2,603,238	2,440,001
Tomatoes ... ,,	1,071,927	1,134,697	953,192	1,007,278
Vegetables, unenumerated ... ... £	—	—	396,784	457,491
	Cwt.	Cwt.		
Apples	4,569,546	3,771,781	2,781,643	2,118,374
Pears	271,518	542,624	326,463	510,691
Plums	594,626	493,984	622,268	537,485
Cherries...	110,192	260,830	167,142	319,969
Strawberries	32,644	34,524	49,362	49,536
Currants	76,419	117,352	110,535	144,390
Gooseberries	34,312	36,215	28,444	21,116
Hops	113,998	313,667	578,739	1,839,854
Flax	1,894,020	1,498,340	3,675,664	3,185,475
Clover and Grass Seeds	458,046	426,475	1,008,772	869,838
Wood and Timber (except Furniture Woods, Hardwoods, and Veneers)	Loads. 10,109,424	Loads. 9,306,278	25,143,332	21,592,844
Oilseeds—Cotton tons	537,491	468,653	2,984,096	2,537,499
,, Flax or Linseed qrs.	2,185,694	2,785,783	4,179,727	4,502,116
,, Rape ,,	308,296	309,325	417,271	386,440
Oilseed Cake ... tons	367,791	371,691	2,165,430	2,128,111
Manures... ... ,,	595,294	599,126	2,057,172	2,067,351
Flowers, fresh ... £	—	—	248,689	242,454

The chief feature of the above table, which shows the imports of various miscellaneous products, is the large purchases of hops during the past year, which have considerably exceeded both in quantity and value those recorded during the past twenty years. The average declared value which stood at 83s. 6d. per cwt. in 1902, and at 101s. 6d. in 1903, further rose to 117s. 3d. per cwt. in 1904. Wood was imported to a smaller extent, and the decline in the value amounted to over three and a half million pounds.

The Improvement of Poor Pastures.

An experiment extending over the years 1901–3 has been carried out at Cransley, Northampton, by the Agricultural Department of the University of Cambridge, in conjunction with the Board of Agriculture and the Northamptonshire County Council, with a view of testing the effects of different manures on poor pastures. A similar series of experiments was conducted at the Northumberland County Demonstration Farm at Cockle Park from 1897–1899, and the results were given in this *Journal* for December, 1899 (Vol. VI., No. 3).

These pasture experiments have been conducted in the following way:—A field of poor grass has been divided up into plots of $3\frac{1}{20}$th acres; the plots have been differently manured; $\frac{1}{20}$th acre has then been fenced off and a hay crop cut, and the remainder of the plot has been grazed by carefully selected sheep. The benefit derived from the manuring is measured by the progress made by the sheep.

A week or two before the grazing season begins, a suitable flock of sheep in lean condition is purchased, and a certain number of animals, varying with the quality of the pasturage, is allotted to each plot. At first each plot will take the same number of sheep, but when the manures begin to tell the numbers must be varied.

Before being put upon the plots all the sheep are fasted for a night (15 hours). They are then weighed and numbered, and the best and worst animals are removed. After the flock has thus been reduced by 15 to 25 per cent. the remaining sheep are divided into uniform lots. A sheep is selected for each plot in rotation, and when the lots have been separated, they are carefully inspected, and any changes necessary to secure uniformity are made. When put on the grass the different lots seldom differ by 1 lb. per head in live weight, and are practically identical as regards quality.

At the end of each month, for five consecutive months, the sheep are again fasted and weighed, and the increase made is credited to the plot. An unfasted sheep varies rapidly in

* An account of experiments conducted by the Bath and West of England Society with a view to testing the effect of basic slag on poor pastures was published in this Journal for October last (Vol. XI., No. 7).

weight, and as a night's fast does no harm and increases the accuracy of the live weight figures, the method of fasting before weighing has been adopted in the Cransley and in most of the other experiments.

If a sheep contracts any disease, it is at once removed, and a similar animal from a flock kept in reserve is substituted.

From the total increase in live weight made by the sheep, the improvement effected by the manures on the pastures is ascertained. An estimate of the profitableness or otherwise of the treatment is made by assuming that in every case 50 per cent. of the live weight increase is mutton, and that the increase is therefore worth $3\frac{3}{4}$d. per lb. if mutton sells at $7\frac{1}{2}$d.

The method outlined above has been carefully tested, and under most conditions gives very satisfactory results, but there are some pastures to which it is inapplicable. For the purpose of measuring and recording the improvement produced in pastures by different manures applied to small plots, it is probably the best that has been devised; but the improvement as measured by this experimental method is less than should be obtained under the ordinary conditions of farming. On large fields grazed alternately, and grazed by a mixed stock, the improvement produced by manures should be considerably greater than on the three-acre experimental plots.

The field selected for experiment is about four miles southwest of Kettering and 470 ft. above sea level. The soil is a poor moist boulder clay which was formerly under the plough, but for the last twenty years it has been in grass. The natural herbage is very thin and poor, weeds occupying a great part of the surface. When a botanical analysis of the hay was made in 1900, the most common grasses were:—Rye-grass, crested dogstail, golden oat grass, and red fescue. Cocksfoot, smooth-stalked meadow grass, Yorkshire fog, and creeping bent were also present on most of the plots. Red clover was fairly common, and so were the small yellow "clover" (*Medicago lupulina*), and bird's-foot trefoil, but white clover was scarce.

The land was manured for the first time in the winter of 1900–1901. The exact quantities of manure applied to each plot in this and subsequent seasons are given in the table on the next page:—

INFLUENCE OF MANURES ON THE FEEDING VALUE OF PASTURES, CRANSLEY, NORTHAMPTONSHIRE (CLAY SOIL). Manurial Treatment and Results for the Seasons 1901, 1902, and 1903. Plots $3\frac{1}{20}$ Acres, 3 Acres Pastured, $\frac{1}{20}$ Acre fenced off for Hay. Figures per Acre :—

Plot.	Treatment.	Cost of Treatment.	L.W. gain per sheep per week.			L.W. increase in 3 years.	L.W. increase in 3 years in excess of Plot 6.		Profit or Loss (—) in 3 years.
			1901.	1902.	1903.		Weight.	Value at $3\frac{3}{4}$d. lb.	
		s.	lb.	lb.	lb.	lb.	lb.		
1	Sheep received 6·66 cwt. Dec. Cotton Cake in 1901 and 1902 ...	47	2·07	3·6	1·31	337·2	178·3	55/8	8/8
2	4 tons Quick-lime in 1901	72	1·53	2·3	1·33	200·5	41·6	13/-	—59/-
3	10 cwt. Basic Slag in 1901	24	1·51	3·3	1·64	327·4	168·5	52/8	28/8
4	5 cwt. Basic Slag in 1901	12	1·26	2·4	1·21	243·8	84·9	26/6	14/6
5	7 cwt. Super. in 1901	19	1·3	2·1	·9	233·2	74·3	23/3	4/3
6	No Manure ...	—	1·0	1·91	1·3	158·9	—	—	—
7	7 cwt. Super. with $3\frac{1}{2}$ cwt. Kainit in 1901, and 100 lb. Sulphate of Potash in 1903	35	1·21	3·0	1·71	299·3	140·4	43/10	8/10
8	7 cwt. Super., 10 cwt. Ground Lime in 1901, and 10 cwt. Ground Lime in 1903	42	1·37	2·9	1·8	307·6	148·7	46/6	4/4
9	7 cwt. Super. and 70 lb. Sulph. of Ammonia in 1901, and 70 lb. Sulph. of Ammonia in 1903	33	1·58	2·4	1·63	285·0	126·1	39/5	6/5
10	6 cwt. Dissolved Bones	31	1·53	2·9	1·28	290·3	131·4	41/1	10/1

GRAZING PERIODS.—In each season the experiment has lasted 20 weeks. It began in 1901 on May 9th, in 1902 on May 10th, and in 1903 on May 15th. In 1902 and 1903 the number of sheep on each plot was reduced at the end of the fourth month.

SHEEP.—In 1901 Shropshire Cross Shearlings, averaging 106 lb. L.W. when put on the plots. In 1902 Hampshire-Lincoln Crosses, averaging $115\frac{1}{2}$ lb. L.W. ; and in 1903 Hampshires, averaging 105 lb. L.W. All the Sheep were unshorn when put on the plots.

It will be seen that there was a remarkable inequality in the increase made in the different years. The season 1902 was much the most favourable of the three, and it is evident that on high-lying, cold and bare pastures the character of the season is

almost as potent a factor in determining productiveness as the manures.

Looking at the results over the three seasons, it will be seen that the grass growing on the unmanured land produced in the sheep an average increase of 53 lb. per acre each season. A heavy dressing of lime on Plot 2 did not greatly increase the yield, but the other plots were much improved. The greatest increase was obtained on Plot 1, but in two years out of the three the sheep were receiving a liberal supply of decorticated cotton cake, while on the other plots they were getting grass only. On Plot 3 the sheep did nearly as well without cake as they did with the assistance of a concentrated food on Plot 1. The manure for this, the most successful plot, was 10 cwt. basic slag; 10 cwt. of basic slag per acre is a heavy dressing, but it was warranted in this case, for with half the quantity there was just half the increase (Plot 4). Superphosphate (Plot 5) did not do so well as basic slag.

Plots 3, 4, and 5 received phosphates only, but there are many pastures for which phosphates, if used alone, would not be suitable, and accordingly Plots 7 to 10 received other fertilisers in conjunction with phosphates. The standard for comparison with Plots 7 to 10, is Plot 5, which got 7 cwt. of superphosphate. Plot 7 received the same quantity of superphosphate with a liberal supply of a potash manure in addition, and potash has increased the yield. Lime and sulphate of ammonia have similarly increased the yield on Plots 8 and 9. The results on Plots 9 and 10 have been similar, but are slightly in favour of dissolved bones.

The chief lesson of the Cransley experiment may be summed up in a sentence. In order to improve poor pastures on clay soils, we must begin by giving a heavy dressing of basic slag; no other manure is likely to be necessary. There is one important proviso:—The pasture must contain clovers, otherwise basic slag will be of no use. The quantity of manure must vary according to circumstances, and should usually run from 7 to 10 cwt. per acre. If the pasture contains small white clover plants and bent grass (*Agrostis*) apply 10 cwt. slag, but if suckling clover, or medic, or bird's-foot trefoil, then 7 cwt. slag is likely to be enough. Farmyard manure, or sulphate of

ammonia, or dissolved bones should not be applied ; some or all of these may be used after the first few years are over, but they are not suitable when beginning to improve. As a potash manure may be useful, especially after the second year, it will be desirable to apply 4 cwt. of kainit to a few of the ridges that have already received slag, so that the effect of potash may be tested. The reason for these recommendations is that the extent of the ultimate improvement will depend on the extent to which the farmer is able to grow clover during the first year or two. Anything that promotes clover will help to lay the foundation of a permanent improvement and anything that hinders clover at this stage will hinder improvement.

These are the lessons which may be drawn from the Cransley experiment so far as it has gone. The subsequent treatment of the land does not come in for discussion at present, but a brief consideration of the effects produced by clover on soil will indicate what the subsequent treatment should be. In the first year after basic slag has been applied, the growth of the clover is not usually very marked, but in the second season there is a very great development and the whole surface is covered by the plant. The result is not only a great increase in food for stock, but a great improvement in the soil itself, for :—(1) The land is manured by the droppings of the stock ; (2) the roots of the clover open up the stiff clay and let air in ; (3) the decayed roots and leaves manure the land ; and (4) clover roots have the power of enriching the soil by passing into it nitrogen collected from the air. This last effect is very important. It is well known that a good clover crop helps land to grow a good wheat crop on arable land, and on pastures there is a similar benefit. The only difference is that in the one case we have red clover and wheat, in the other white clover and pasture grasses.

In consequence of the beneficial action of clover on the natural grasses, these begin to spread, and in two or three years they become abundant. It is fortunate that they do fill up the soil, for clover itself would not continue to do so for any length of time. The subsequent treatment of a pasture must therefore differ from that adopted at first, for when the farmer begins improving his land he must think only of the clovers, and the

whole plan of manuring must be designed to encourage them, but at the end of the second or third season he has to deal with a mixed herbage, and the manures must be of a kind that will encourage a permanent mixed herbage. The proper treatment will vary in different circumstances. A second application of phosphates may be beneficial, not in a heavy dressing as at first, but at the rate of from 2 to 3 cwt. of basic slag or superphosphate. A little potash and lime may also prove useful; but the manure most likely to do good will be that from well-fed animals either carted on to the land in dung, or made on the land from oilcakes. The decorticated cotton cake fed on Plot 1 at Cransley was practically wasted, but if this plot had received 10 cwt. basic slag three years before the cotton cake was used, the results would probably have been very different.

In the foregoing paragraphs, white clover has been spoken of because it is the best of the clovers for the purpose of improving land, but there are others which may be beneficial, and some of them were very common on the Cransley soil. *Medicago lupulina* or yellow "clover" and yellow or red suckling clover, for example, were both abundant. The above remarks apply generally to their treatment, but these plants are much less useful than white clover, and they will not pay for such heavy dressings of manure. It is likely that the Cransley plots would have shown greater profits if fewer of the yellow flowered clovers had been present and their places had been occupied by white clover sown in the spring of 1901.

Experimental Crop Tests by Farmers in Ontario.

The Agricultural and Experimental Union of Ontario was established in 1879 with a view to forming a bond of union between the Ontario Agricultural College and its old students. In 1886 a commencement was made of a system of experimental work which has since assumed very large dimensions. The plan adopted is to prepare a scheme of experiments, chiefly of a simple character, such as the testing of the productive qualities of two or three arieties of grain, roots, green crops, &c., and to supply free of

charge the necessary seed with instructions to any farmer who will undertake to carry out the test in the manner laid down and to furnish the Union with a report of the results obtained. In 1886 the work was begun with twelve experimenters, while in 1904 no less than 4,650 persons carried out one or other of the thirty separate tests included in the scheme for that year. The expenses of the undertaking are met chiefly by a Government grant of £290 annually.

Great care is exercised in planning the various co-operative experiments in such a way that they can be successfully undertaken by the people who are to be benefited thereby. In every instance the work is made as clear of comprehension, as definite of purpose, and as simple in method of operation as is consistent with the objects desired. It is the constant aim of the Union to make all the experiments as interesting and valuable as it is possible to make them ; and the work has been fruitful in increasing agricultural investigations and in diffusing practical information among the farmers of Ontario. It is stated, moreover, that it has led farmers to take an interest in the work of the Ontario College and Experimental Farm. Some evidence of this may be seen in the fact that the institution is visited by some 30,000 farmers annually.

Importation of Potatoes into Norway.

In a recent despatch to the Foreign Office, the Acting British Consul-General at Christiania draws attention to a possible opening for British exporters of potatoes. In 1903 the total imports of this article into Christiania amounted to 7,258 tons, chiefly from Germany and Denmark. From July to November, 1904, the total imports amounted to 4,406 tons, chiefly from Belgium, Holland, and Denmark. The market price of potatoes in Christiania on December 16th was quoted at about 2s. 6d. to 2s. 9d. per cwt. A list of potato importers at Christiania, which has been supplied by the Consul-General, can be obtained on application to the Board.

The Board think it may be useful to publish in this *Journal* from month to month a summary of the regulations, so far as they can be ascertained, affecting the exportation of British live stock to foreign countries.*

Live Stock Import Regulations.—Argentina.

The regulations relating to the Argentine Republic are contained in the General Animal Sanitary Regulations of January 29th, 1903, which provide that until quarantine stations are established in other parts of the Republic, Buenos Ayres is the only authorised port for the importation of animals from any part of the world, except Uruguay.

Captains of vessels carrying live stock from the United Kingdom to Buenos Ayres must provide themselves, before taking such stock on board, with a certificate granted by the Board of Agriculture and duly legalised by the Argentine Consul to the effect in the case of cattle (1) that cattle plague neither exists nor has existed in the country during the previous ten years; and (2) that contagious pleuro-pneumonia and foot-and-mouth disease neither exist nor have existed during the previous six months.

In the case of sheep the certificate, in addition to the above statements as to cattle plague and foot-and-mouth disease, must certify that sheep-pox does not exist in the country in an epizootic form, and that no case has occurred in the district from which the live stock proceed during the preceding six months.

In the case of goats or swine, the certificate must state that cattle plague and foot-and-mouth disease do not exist and have not existed for the previous ten years and the previous six months respectively.

When carrying horses, mules, or asses the certificate must state (1) that cattle plague does not exist and has not existed during the previous ten years; and (2) that glanders and farcy do not exist in the country in an epizootic form, and that in the district whence the animals came there has been no case of such disease during the previous six months.

* The live stock import regulations of the United States appeared in this Journal Vol. X., No. 1, June, 1903, and Vol. XI., No. 7, October, 1904.

In addition to the certificate required from the Board of Agriculture, it is customary for the stock to be accompanied also with a certificate, which may be signed by any duly qualified veterinary surgeon, relating to the health of the animals to be exported.

The owners of vessels or their representatives must present to the Importation Inspectors immediately on the arrival of the vessel at Buenos Ayres, a report stating the number of animals on board, the class, breed, or variety, owner and consignees of the animals, the port and date of embarkation, and further specifying the number of animals that died during the voyage, and indicating the apparent cause of death and the symptoms observed.

On arrival at Beunos Ayres, all cattle must be quarantined for forty days, during which time they will be absolutely isolated under the care of the Division of Animal Industry. At the conclusion of the quarantine period they will be officially tested with tuberculin, and all cattle reacting will be considered as tuberculous, and will be slaughtered.

Sheep, goats, and swine are to be similarly quarantined for fifteen days.

Horses are to be quarantined for eight days, and can then be tested with mallein. Those that react are to be slaughtered immediately, together with all those that may have been in direct or indirect contact with them.

All expenses of quarantine, isolation, maintenance, treatment, and slaughtering of imported animals must be defrayed by the owners or consignees.

Milk Fever.

Parturient Apoplexy, also called Milk Fever, Dropping after Calving, &c., is a disease of cows, more especially of milking breeds, and chiefly occurs at the time when they have attained their fullest milking capacity. It has been recognised for generations, and has been a fruitful cause of loss to the agricultural community, the deaths in many instances averaging from 40 to 60 per cent. of all cows attacked.

An account of the symptoms, with suggested methods of

prevention and treatment, is given in the Board's leaflet (No. 96), and reference is made to a successful method adopted by a Danish veterinarian within the last few years which has considerably increased the percentage of recoveries. A "Farmers' Bulletin" (No. 206) recently issued by the United States Department of Agriculture gives a detailed account of this treatment, of which the following summary may be of interest :—

Numerous theories have been advanced by various investigators as to the direct cause of milk fever. Schmidt, of Mühlheim, claimed that it was due to an auto-intoxication, produced by the absorption of toxins from the uterus. This theory was superseded in 1897 by that of J. Schmidt, of Kolding, Denmark, who claimed that the disease was produced by the absorption from the udder of leucomaines, resulting from the decomposition of the colostrum. He advocated the injection of the udder with an aqueous solution of potassium iodide, which method was followed by an immediate decrease in the mortality to a very marked degree. The great success attendant upon this line of treatment at once gave the theory general recognition, and this very difficult problem was at last thought to be solved. Within the last few years injections of etherized air, oxygen, and sterile atmospheric air have been used with wonderful success, To Andersen, of Skanderborg, belongs the credit of first having made use of plain atmospheric air. The results were astonishingly successful. Thus out of 914 cases treated in Denmark 884, or 96·7 per cent., were restored to health. The record of 140 of these animals shows that recovery occurred in the average time of 6$\frac{2}{3}$ hours. Of this number 25 cases required a second injection, while in three it was necessary to give a third treatment before they were able to get on their feet. The treatment is practically harmless, as the statistics of the above-mentioned 914 cases show that only one cow was affected with a severe attack of caked bag, while in four other cases a milder inflammation of the udder was apparent. The method of injecting filtered air into the udder is easy of manipulation, requires but little time, and is readily accomplished by means of a milk fever apparatus constructed for the purpose.

This treatment has so greatly reduced the mortality that prevention is no longer such an important problem, and, therefore, preventive measures which have a severe and lasting effect upon the animals should be abandoned. The starving of suspected animals for two weeks prior to the birth of the calf has long been advocated, but this measure is no longer considered advisable, as it is better to have cows attacked with the disease once in a while than to decrease the flow from every heavy-milking cow for one to three weeks after she comes fresh by starving her before calving.

A method which is not quite so sure of reducing the plethoric condition of the cow, but which, neverthless, proves very efficient and is without the slightest permanent injurious effect, is the administration of 1 to 1½ lb. of Epsom salts two or three days prior to calving. In case this has been neglected and a well-nourished, heavy-milking cow has passed through an easy non-exhausting calf birth, the administration of the salts after labour should by no means be neglected.

Another very good preventive measure, and one easily carried out, is to give the cow plenty of exercise up to the time of calving. Many animals are allowed to run continuously on pastures from the time they go dry until a week or two before calving, when they are transferred to the stable without any subsequent exercise. This is very conducive to the enriching of the blood and the development of the disease.

Husk or Hoose in Calves.

Husk or Hoose is a parasitic disease which attacks calves and sometimes lambs. It is caused by small thread-like worms (*Strongylus micrurus*) in the windpipe, which set up an irritation causing a husky cough. The disease is caused by keeping calves on wet, damp land infected with the ova of the parasite, and its prevention can be best effected by keeping young animals in autumn off the fields which appear specially liable to convey the disease. The dressing of these fields about July with a medium dressing of lime or with 5 cwt. of salt per acre is

believed to be useful. The calves should be changed frequently to fresh pasture, should be comfortably housed at nights, and should be well fed.

The Irish Department of Agriculture recommends the following treatment which has been found effective :—Give twice daily to each affected calf $1\frac{1}{2}$ tablespoonfuls of a mixture composed of 1 drachm of oil of cloves, 3 oz. spirits of turpentine, and 24 oz. of linseed oil. A more drastic method of curing the disease by means of intertracheal injections is sometimes adopted; this, however, is a delicate operation, and should only be undertaken by a qualified veterinary surgeon.

Movement of Swine from Ireland to Great Britain.

The Board of Agriculture and Fisheries have made an Order, under the Diseases of Animals Acts, 1894 to 1903, which is to come into operation on the 23rd of January, 1905, regulating the landing in Great Britain of swine brought from Ireland.

Swine brought from Ireland may be landed in Great Britain for the purpose of movement to a particular bacon factory or slaughter-house, or to any particular lairs, market, or sale-yard specially authorised to be used for such purpose by the local authority of the district, if accompanied by a licence authorising such landing and movement granted by an Inspector or other officer duly authorised in that behalf by the Department of Agriculture and Technical Instruction for Ireland, and subject to the following conditions, namely :—

1. The swine shall, before being landed, be marked by and at the expense of the owner by the painting with an indelible composition of red colour of a broad line down the back and another broad line across the loins of each of the swine, thus +, each line being not less than nine inches long;

2. The swine when landed shall be moved, by railway so far as is practicable, to the place of destination specified in the licence, and during such movement shall not be permitted to come in contact with swine not marked under the Order;

3. Swine moved under the Order to any lairs, market, or saleyard shall be moved therefrom only if accompanied by a licence authorising such movement granted by an Inspector of the local authority of the district in which the lairs, market, or saleyard may be situate and only to a bacon factory or slaughter-house specified in the licence, and such movement shall be subject to the conditions of the Order as to marking and movement ; and

4. Swine moved under the Order to a bacon factory or slaughter-house shall after their arrival thereat be there detained until they are slaughtered.

Insurance of Swine in Bavaria.

The Bavarian Law on Cattle Insurance* of May 11th, 1896, provides that only cattle and goats shall be insured by the Government, and not swine. Swine, however, are insured in the municipal slaughter-houses throughout Bavaria, and Mr. L. Buchmann, H.M. Consul at Munich, has furnished the Board, through the Foreign Office, with the following particulars on the subject.

The slaughter-house in Munich began insuring swine on June 1st, 1903. The premium for the insurance of swine about to be slaughtered amounts to 10 pfennigs (rather more than a penny) per animal. Swine sold for breeding purposes are insured for the space of three days after sale against " wild fire " and " swine-pox." Swine sold for slaughter are insured for the space of fourteen days after sale against " tuberculous disease," trichinosis," and " measles." Only apparently sound swine are insured.

From June 1st, 1903, to September 30th, 1904 (sixteen months), 301,321 swine were thus insured in the Munich municipal slaughter-house, at the rate of about a penny each ; the sum paid in premiums during this period was about £1,506 10s., out of which losses were paid to the amount of about £1,370, so that the balance on the insurance for swine amounted to £136 10s. for sixteen months.

* Information respecting the Insurance of Live Stock in Bavaria was given in this *ournal,* Vol. XI., No. 1, April, 1904.

The Guild of Pork Butchers in Nuremberg insure swine for the duration of the market only, viz., from Monday morning to Saturday night, the premium being 1½d. per animal. The insurance company claims all sums received for the sale of carcases of swine, the insurance of which has to be paid. Hogs kept for breeding purposes are not insured. A charge of 5s. is made for membership of the above insurance company.

Preparation of Fruit Pulp in France.

Pulping is a useful method of preserving fruit intended for jam-making. It enables the fruit to be sent long distances and to be sold out of the season when the market is not overstocked. The practice prevails to a considerable extent in some parts of France, particularly in the neighbourhood of Dijon, in the Côte d'Or, whence the pulp is exported to this country, and in the Departments of Bouches du Rhone and Vaucluse. Briefly, the method is to sterilise the fruit in tins after the removal of the stalks and stones and when carefully prepared the pulp can be preserved for a long time. The black currant, cherry, raspberry, red currant, plum and apricot are treated in this way, but the demand for the pulp in France varies with the different fruits ; thus the black currant, apricot, and plum are readily disposed of, but the red currant meets with less demand, while in the case of cherries, buyers of any considerable quantities are hard to find. The preparation of these pulps forms the subject of a Report to the French Ministry of Agriculture by M. Vercier, Professor of Horticulture at Dijon, and some of the particulars given in his Report may be of interest to fruit-growers in this country.

The black currant appears to be the fruit most largely preserved in the Côte d'Or, and since 1897 it has been exported to England under the name of black currant pulp for use in confectionery. The crop in this Department amounted in 1903 to about 19,400 cwt., and in a good year it may reach 25,000 cwt. It is estimated that about one-half of the crop is sent to this country. The pulping is not usually performed by the growers, as the work requires to be done on a fairly large

scale. The utensils required include a vertical boiler for generating steam; two pans, holding about 6½ gallons each, well made of stout copper, with spouts to pour out the contents and levers for tilting; and a metal tank for sterilising. Both the pans and the tank must be constructed so that they can be heated with steam from the boiler. The cost of an installation for making about 60 cwt. of pulp a day, including fixing is estimated to cost in France from £120 to £160.

The method of preparation is as follows:—The currants are freed from their stalks by women, at rates varying according to their skill of from 110 to 240 lb. a day each, so that a factory dealing with 60 to 80 cwt. daily would require probably fifty women or children for this work during the season. After the removal of the stalks, the fruit is put into the copper pans, about 17 lb. at a time, with rather less than a pint of cold water; steam is introduced into the false bottom of the pan and the fruit heated to boiling point, it is stirred with a wooden spoon, and after boiling for one minute the steam is shut off, the fruit emptied into receptacles and immediately put into tins and carefully soldered up. These tins weigh when filled, and including the box, about 11 lb. They are then placed for twenty minutes in a tank of water which is heated by steam to boiling point. During this time it can be seen if any of the tins leak, in which case they are taken out and re-soldered, after the air has been allowed to escape. The tins are packed in wooden cases containing ten each, *i.e.* about 1 cwt. gross to the case. Only about 88 lb. of fruit are required for 1 cwt. of pulp gross, the difference being represented by the weight of the tins and the added water.

The cost of preparing and exporting the pulp to London is estimated by M. Vercier to be about 8s. 10d. per cwt. case of ten tins, made up as follows, exclusive of the cost of the fruit:—

	s.	d.
10 tin boxes...	4	0
Soldering	0	6
Removing stalks (88 lb.)	1	7¼
Cost of preparation, coal, &c.	0	1¼
Case for Packing	0	10
Sundries and carriage	0	6
Carriage: Dijon to London	0	6½
Interest on capital, depreciation, &c.	0	9
	8	10

If the pulp is sold in London at an average price of 28s. per cwt., there remains a balance for the manufacturer of 19s. 2d. Contracts are commonly made with the growers for the supply of fruit for periods of ten or twelve years at varying prices, of which 12s. 9d. per cwt. may be taken as an average. The prices obtained by growers who do not sell by contract vary very much according to the season and other circumstances.

Red currants and raspberries are prepared in a similar way to black currants.

In pulping cherries, the stalk and the stone must be removed, and women accustomed to the work can stone about 11 lb. per hour. They use a simple tool for this purpose, consisting of a flattened copper wire bent in the shape of a U with the ends fixed in a wooden handle. The fruit is treated in the same way as black currants, except that if it yields enough juice to prevent it sticking to the pan, water need not be added. Only large black cherries are used, the white-heart cherry not being employed at all; the Montmorency is preferred, the Bigarreau being less suitable.

Apricots and plums require to be quite fresh, and for these fleshy fruits the sterilisation must be carefully carried out. After stoning, which is done by hand, the fruit is put in perforated copper vessels and plunged into boiling water; they are kept in this for about one minute if the fruit is quite ripe, and from two to three minutes if unripe. The skin should slip from the fruit if it is squeezed between two fingers, but in order to preserve the shape of the fruit actual cooking should be avoided. On removal from this bath they are put into tins so as to weigh 11 lb. including the tin, and soldered down for further sterilisation, as in the case of black currants. Apricots with a brilliant red colour are generally selected, and the varieties considered most suitable in France are the Kuizet, the Muscat, and Blanc-rosé. The apricots are stoned by women at the rate of about 5d. per cwt., and the stones are dried and sold to firms who use the kernels, the average price obtained being about 5s. 2d. per cwt.

For preparing the pulp of fleshy fruits, such as plum, apricot, &c., some manufacturers use the simpler and less costly method of heating over a fire. The pan is placed or hung over the fire,

and the fruit is protected against being burnt by the addition of more water. The tank or bath for sterilisation can in the same way be fitted over a fire.

The quality of the tins and the manner in which the soldering is done are of the first importance. The tins may be made with the top in one piece, which is soldered on after the fruit is put in ; or there may be an opening in the top lid, which is covered by a capsule and soldered as in the first case. For acid fruits, such as currants and raspberries, the interior of the boxes must be glazed, but this is not necessary for apricots and plums.

A serious matter in the preparation of the pulp is the difficulty in keeping the fruit for more than a few days and in procuring sufficient hands to remove the stalks and stones. In order to prolong the period of manufacture, experiments have been carried out by M. Vercier as to the effects of cold storage on five lots of black currants gathered at different stages of maturity.

Lot No. 1.—These were gathered while still green, fifteen or eighteen days before maturity, and kept perfectly for one month (24th June to 24th July), from which date they gradually withered and dried.

Lot No. 2.—These were gathered twelve days before maturity, and kept in good condition for forty days.

Lot No. 3.—These were gathered nine days before maturity, at which time they had been quite black for two days ; these kept for forty-two days, and on the fifty-sixth day, though withered, they were still healthy.

Lot No. 4.—These were gathered nearly ripe, some five or six days before maturity ; they kept perfectly for forty-six days and were good for twelve days later.

Lot No. 5.—These were gathered when quite ripe ; they kept fresh for twenty-six days, but nine days later they showed slight signs of withering.

Where fruit need only be kept for eight to ten days, a cool cellar will suffice if the fruit is put in airy packages of medium size, *i.e.*, holding about 45 lb. For longer preservation recourse must be had to a cool chamber or ice-house.

Experiments in Fruit Growing at Woburn.

Investigations into the manurial requirements of strawberries, gooseberries, currants, raspberries and apples have now been carried out at the Woburn Experimental Fruit Farm for the past seven years, and the merits of the various dressings applied are discussed in considerable detail in the fourth report which has been prepared by his Grace the Duke of Bedford and Mr. Spencer Pickering, F.R.S. The results obtained, which are of great interest to fruit growers, can be briefly summarised as follows :—

Strawberries.—(1) Moderate dressings of dung (12 tons to the acre), or of artificials, gave 12 to 15 per cent. increase in the crops. (2) The dunged plots were much superior as to the size and quality of the fruit, and, in a lesser degree, as to the growth and vitality of the plants. (3) Heavier dressings of dung increased the size of the plants but had no effect on the crops. (4) Heavier dressings of artificials had no good effect on the size of the plants, and had a deleterious effect on the crops. (5) Neither dung nor artificials rendered the ripening earlier though they slightly extended the period of the pickings. (6) Water applied to the plants during the swelling of the berries produced no very certain effect; water containing artificial manures produced no more effect than water alone.

Gooseberries.—(1) Moderate dressings of dung increased the growth, but diminished the crops for the first three years; they then increased the crop considerably. (2) Moderate dressings of artificials produced no appreciable effect on the crops. (3) The dunged plots were much superior to the others as regards size and quality of fruit and as regards the growth and vitality of the bushes. (4) The plots dressed with artificials were but little better than those receiving no dressing, and the bushes in them were quite worn out and dying at the end of seven or eight years. (5) Heavier dressings of manure produced no effect on the crops but increased the growth of the bushes especially in the case of dung.

Currants, Red and White.—(1) Moderate dressings of dung and artificials increased the crop by about 28 per cent. The dung had least effect at first, owing to its increasing the growth,

and the artificials had least effect at the end of the period of the experiment. (2) The dunged plots were much superior to the others as regards size and quality of fruit and growth of bushes. (3) Heavier dressings of dung increased the crops and the size of the bushes considerably; heavier dressings of artificials increased the size of the bushes slightly and had but little effect on the crops.

Raspberries.—(1) Moderate dressings of dung and artificials increased the crop by about 30 per cent. The dung may have had only a small effect on the crops during the first year or two, but circumstances prevented this from being ascertained; the artificials had considerably less action than dung during the later years. (2) The dunged plots were superior to the others as regards size and quality of fruit. (3) Heavier dressings materially increased the crop in the case of dung, but decreased it in the case of artificials. (4) The effect of the dressings on the growth of the canes was not determined.

Apples.—Neither moderate nor heavy dressings of dung or artificials, nor of both combined, had any appreciable effect on any feature of the trees, nor on the crops from them. The total effect did not amount to 5 per cent., and even that effect was very doubtful. The only exception was in the case of nitrate applied in the early or late summer, which in several seasons produced a good effect. In a lighter and poorer soil the results obtained indicate that manures will there have a more positive action.

Thus the crops were increased by moderate dressings of dung in every case except that of apples, and were increased by artificials in every case except that of apples and gooseberries. The growth was increased by dung except in the case of apples, and in a lesser degree by artificials. Heavier dressings, especially of dung, nearly always increased the growth, but increased the crops in the case of currants and raspberries only; in the case of strawberries and raspberries, when the dressing consisted of artificials, the increase of manure diminished the crops. Dung had a marked effect on the size and quality of the fruit in every case except that of apples; with apples there were slight indications of a similar action.

That the absence of effect of manures on apple trees may, to

a certain extent, be due to the peculiarities of the soil at Woburn is possible, but this cannot be regarded as the sole, or even principal, explanation, because the same absence of effect has not characterised the results with other fruit plants, and as each of these plants shows certain differences in behaviour under manures, it is probable that the peculiarity in the case of apple trees is more due to the nature of the plants than to the character of the soil.

That the chemical composition of the soil is but a poor guide to manurial requirements of fruit trees must be evident from the very different behaviour of different kinds of trees in the same soil, while the paramount importance of dung in the case of gooseberries at Woburn proves that the physical condition of the soil is, in some cases at any rate, of far more importance than its chemical composition, for these plants will fail and even die in a soil which contains abundance of chemical food. Another striking instance of the same fact is seen in the circumstance that it was on currants and raspberries that artificial manures had the greatest effect, although these were the two varieties of fruits which were planted in that part of the farm where the soil was much richer than elsewhere.

In conclusion, it is pointed out that the results obtained at Woburn are not such as to make it advisable for a grower to spend any money in manuring apple trees, especially in heavy and fairly fertile soil, unless he had ascertained by an actual trial on his own ground, and by a trial extending over several years, that such manuring would repay him. In the case of gooseberries, dunging the greater part of the plantation is recommended, and reserving only a small portion for trials with artificial manure and with no manure. In the case of currants, raspberries and strawberries, the same experimental treatment seems desirable as with gooseberries wherever dung or some manure containing a considerable proportion of organic matter is procurable at a moderate cost; where this cannot be obtained, the bulk of the plantation might be treated with artificials, and only a small portion reserved for treatment with dung. In no case, except for the purpose of trial, is a heavier dressing than 12 tons per acre, or its equivalent in artificials, recommended, and in no case should any conclusions be drawn as to the action

of the manures on the strength of less than three or four years' results.

One of the most important lessons brought out in the report was that the modern farmer, if he is to be successful, must to a certain extent be an experimentalist. An experimental station, it is pointed out, may determine facts of fundamental importance, and may indicate the direction in which special observations for each locality should be made ; but as the observations at such a station must necessarily be confined to the particular soil on which the station is situated, there must be many details dependent on the peculiarities of other soils which cannot there be ascertained. These should be determined by each farmer for himself. An experiment, to the ordinary farmer, often consists in trying some advertised manure, probably during one season only, and probably also on the whole of a field which may often be ill-adapted to the purpose. The result of such an experiment (which may be exceptional owing to some exceptional character of the season) may lead him either to adopt that manure as infallible or reject it and abuse experiments generally.

For a grower to obtain information of real value, the report points out that some uniform field, or portion of a field, should be selected, and one part of it treated with one dressing and the rest with some other dressing, repeating the treatment for two or three seasons, and, perhaps, reversing the treatment in the case of the two portions. The results would show which dressing paid best. The experiment might cost a few shillings extra in labour and an hour or so in calculations, but would probably be worth many pounds a year in future crops. On a subsequent occasion it would be easy to try a further experiment, such as a combination of natural and artificial dressings and ascertain whether any advantages accrued sufficient to compensate for the additional expenditure.

In the same way, when a grower wishes to lay down a fruit plantation to grass, it would be easy, in most cases, to lay down a portion of it only in the first place and ascertain what the effect on the trees is and whether it would be advisable, or not, to treat the whole plantation in a similar way.

Such simple experiments or trials are not beyond the means

or capacity of any fruit-grower of average ability, and the marvel is that they are so rarely made, and that men whose existence depends on the correctness of their practice should not adopt the most practical of all methods of obtaining the knowledge which they require—that of ascertaining for themselves by direct trial what treatment of their crops is the best. Special training, no doubt, is necessary for the execution of elaborate experiments, and special knowledge is necessary to know how far the results can be generalised so as to be applicable to other land and circumstances, but the case is quite different when a grower has only to ascertain what treatment succeeds best on his own land. Perhaps the oft-repeated and more often mistaken cry of the antagonism between theory and practice is the reason why growers are so prejudiced against experiments, mistaking experiment for theory and the blind observance of traditions for practice. The spirit of investigation, when properly directed, can never fail to advantage the investigator, and if this spirit could but be developed amongst fruit-growers a mass of observations would soon be collected which, when properly digested, would be of incalculable benefit to the whole industry.

Investigation of Plant Diseases in Germany.

The Department of Plant Diseases of the German Agricultural Society has recently been transferred to an Imperial Institute. In 1889, at the instigation of Prof. Kühn, of Halle, the German Agricultural Society resolved to form a section which would be concerned with the investigation of the diseases and insects that attack crops. By the summer of 1891 the section had established communication with twenty-one local stations distributed throughout Germany. These consisted, for the most part, of the State experimental stations, though some were of a private character. The work of investigation and the distribution of information was carried out without any subvention from the society. The first report was issued in 1893, and a volume has appeared annually since that year. The first report contained 106 notices of attack, whereas the number in the twelfth report was 3,904. At the present

time some forty local stations are affiliated with the central society. A book entitled "The Protection of Crops against Diseases and Insects" was issued free to members of the society in 1892, and 22,000 copies have been distributed.

The work, having somewhat outgrown the resources of the society, has now been taken over by the Biological Department of the Imperial Board of Public Health, and considerable extension is contemplated. The various States of the Empire have been approached by the Imperial Home Office with a view to securing the support of their research stations, and cordial co-operation has been promised. A central institute, fully staffed and equipped, will be established in each State, Province, or group of Provinces, and each central institute will have subsidiary institutes or stations affiliated with it. The latter will consist largely of local colleges, agricultural schools, experimental stations, and the like. Finally, each of these subsidiary stations will be associated with local collectors, chiefly farmers, gardeners, and foresters, of whom it is proposed to appoint about 1,000 for the Empire. The information supplied by the collectors will, in the first instance, be transmitted to the subsidiary institutes, from which it will be passed on to the central institutes, to be finally issued in an annual report to the Board of Public Health.

Applications for advice will for the most part be dealt with by the subsidiary institutes, only the more difficult problems being investigated by the central institutes.

[*Mitt. Deut. Land. Gesell.*, Part 46, 1904.]

Enquiry into Food of Rooks and Crows in Germany.*

The results of an investigation into the food of rooks and crows which was carried out in the years 1897–8 by Dr. Schleh, of Münster, have recently been published by the German Agricultural Society as a continuation of previous reports on the same subject. In all, some 481 separate examinations were made, though only 474 are included in the report. The species examined included *Corvus frugilegus* (rook), *Corvus corone* (carrion crow), *Corvus cornix* (hooded crow), and *Corvus monedula* (jackdaw), and the birds varied in age from two-

* [*Arbeiten der Deutschen Landwirtschafts-Gesellschaft.* Part 91. 1904.]

day-old nestlings to old birds. As regards crop and stomach contents, the report distinguishes between animal, vegetable, and mineral foods, and the variety of food eaten is very striking. Dr. Schleh found that 93·7 per cent. of the birds contained animal food of some kind, whilst 92·2 per cent. contained vegetable food, so that it will be seen that most of the birds subsisted on foods of both kinds. Seeds of agricultural plants and forest trees, &c., to the number of 9,271 grains, were found in 292 of the birds, or 61 per cent. Several crows were found to contain from 150 to 400 grains of corn, while a few rooks contained over 100 grains, and rook nestlings over 50 grains each. Maize, beans, &c., and forest seeds were also found. On the whole, however, cereals were found in large numbers in only a moderate number of cases. Weed seeds were found in 7½ per cent. of the birds, one specimen (carrion crow) having taken as many as 58 seeds of *Polygonum*.

The animal food eaten by these birds included rats, mice, moles, birds, spiders, worms, millipedes, and a great variety of insects, more especially beetles. No less than 78 per cent. of the birds contained insects, the beetles alone averaging 6½ per bird. Wireworms and chafer-beetles figure largely in the returns, birds being found in some instances to contain upwards of 60 wireworms, whilst nestlings were found surfeited with chafer-beetles, and in one case a nestling (rook) had been given nearly 40 chafer-larvæ. In many cases it was found that the nestlings had been fed on nothing but animal food, chiefly insects, but it is stated that the old birds feed their young with the same kind of food they themselves eat.

In view of the widespread distribution of these birds, their numbers, their powers of reproduction, and their adaptability to the different kinds of food available in different districts, a definite judgment is, it is observed, rendered difficult, and in the opinion of Dr. Schleh the results of investigations can often only be considered as typical of a given district. Indeed, it may be doubted if the food taken in any neighbourhood can be judged by the crop and stomach contents of crows, as the birds travel far in search of food. On the coast members of the crow family may subsist on shell-fish refuse, in forest districts they may take tree-seeds and small forest animals, in the neighbourhood of rivers fish may be consumed, in meadows and

pastures insects probably form their staple diet, whilst where the country is under the plough the hunger of these voracious birds leads them to attack the growing crops, and in order to obtain a correct view of the question it would be necessary to make a great number of separate investigations in all parts of the country and at all times of the year.

The author quotes Taschenberg, Ritzema Bos, Giebel, Stengel, Walter Müller, Klaus, and many others as being among those who believe rooks and crows to be useful in Germany. On the other hand, Liebe, Martin, Ludwig, Plehn, Burbaum and others are named as investigators who hold the birds to be harmful to, agriculture. In conclusion, Dr. Schleh considers that his investigations show that crows and rooks are, on the whole, more useful than harmful, and especially in the breeding season. There can, however, be no doubt that where the birds at times occur in excessive numbers, and where the damage becomes serious, their numbers should be reduced.

Recent Publications of the Board.

In compliance with an Order of the House of Commons, the Board of Agriculture and Fisheries have presented a Return of all Inclosure Awards or copies of Inclosure Awards which are at the present time deposited or enrolled with the Clerks of the Peace or of the Councils of the Counties of England and Wales. This publication [*H.C.* 50 of 1904; price 1s. 7d.] sets out alphabetically under the head of each county the name of each common affected by an award, the parish or township in which such common was situated, and the date of the Act of Parliament authorising the inclosure and the date of the award.

The following leaflets have also been issued since the previous notice in the *Journal* (November, 1904, p. 504), and single copies may be obtained free of charge on application to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W.:—"Sleepy Disease of Tomatoes" (No. 116); "Peach Leaf Curl" (No. 120); "Construction of Pigsties" (No. 121); "The Cabbage Root Fly" (No. 122); "The Shoot and Fruit Moth of Red and Black Currants" (No. 123); "The Asparagus Fly" (No. 124).

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of December, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	England.		Scotland.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 11	7 6	37 8	34 3
Herefords	7 9	7 2	—	—
Shorthorns	7 9	7 1	36 7	33 5
Devons	7 10	7 2	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8	7¼	8¾	6¾
Sheep :—				
Downs	8¾	8¼	9¼	8
Longwools	8½	7¾	8½	7¼
Cheviots	9	8¼	9	7¾
Blackfaced	8½	8	8½	7¼
Cross-breds	8¾	8	9¼	8¼
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	5 7	5 3	5 8	5 2
Porkers	6 5	5 11	6 4	5 8
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
In Milk	21 4	17 17	20 12	16 5
Calvers	20 1	16 18	19 10	16 0
Calves for Rearing	2 3	1 14	1 18	1 7
Store Cattle :—				
Shorthorns—Yearlings ...	8 18	7 17	9 15	8 0
,, Two-year-olds	12 14	11 3	13 13	11 15
,, Three-year-olds	15 13	14 7	15 7	13 6
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools—Hoggs, Hoggets, Tegs and Lambs	41 3	35 9	—	—
Scotch Half-breds ,, ...	—	—	30 11	28 8
Store Pigs :—				
Under 4 months	22 11	16 9	19 8	14 8

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of December, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	53 8	50 2	46 8	52 6	56 0*	54 10*
	2nd	50 2	43 2	42 0	42 0	52 6*	46 8*
Cow and Bull ...	1st	—	42 0	42 0	40 10	46 8	36 2
	2nd	—	36 2	37 4	31 6	39 8	32 8
U.S.A. and Canadian :—							
Birkenhead killed	1st	52 6	47 10	46 8	50 2	45 6	—
	2nd	45 6	42 0	40 10	37 4	43 2	37 4
Argentine Frozen Hind Quarters ...	1st	28 0	31 6	30 4	29 2	32 8	32 8
American Chilled Hind Quarters ...	1st	56 0	54 10	52 6	52 6	54 10	56 0
VEAL :—							
British	1st	65 4	59 6	65 4	65 4	—	—
	2nd	53 8	50 2	58 4	51 4	—	—
MUTTON :—							
Scotch	1st	67 8	—	73 6	74 8	73 6	67 8
	2nd	61 10	—	64 2	65 4	65 4	56 0
English	1st	64 2	65 4	68 10	72 4	—	—
	2nd	57 2	50 2	60 8	63 0	—	—
Argentine Frozen ...	1st	37 4	38 6	39 8	36 2	38 6	39 8
LAMB :—							
New Zealand ...	1st	60 8	61 10	—	58 4	—	—
	2nd	57 2	—	—	—	—	—
PORK :—							
British	1st	52 6	56 0	56 0	56 0	49 0	50 2
	2nd	44 4	46 8	49 0	45 6	46 8	42 0

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each of the under-mentioned Weeks in 1904, and in the corresponding Weeks in 1903 and 1902.

Weeks ended (*in* 1904).	Wheat.			Barley.			Oats.		
	1902.	1903.	1904.	1902.	1903.	1904.	1902.	1903.	1904.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Jan. 2 ...	27 7	25 0	26 3	26 7	23 11	22 1	19 10	16 10	15 5
,, 9 ...	27 8	24 11	26 6	26 7	24 1	22 6	20 0	17 0	15 7
,, 16 ...	27 8	24 11	26 11	26 11	24 1	22 3	20 0	16 10	15 9
,, 23 ...	27 7	25 0	27 3	26 7	24 1	22 4	20 3	16 11	15 11
,, 30 ...	27 4	25 4	26 11	26 7	24 3	22 3	20 2	17 0	15 8
Feb. 6 ...	27 2	25 6	26 9	26 9	23 9	22 4	20 3	16 11	15 11
,, 13 ...	26 11	25 6	26 8	27 5	23 7	22 2	20 3	17 1	15 9
,, 20 ...	27 1	25 4	26 11	26 11	23 4	22 7	20 4	17 1	16 0
,, 27 ...	27 1	25 3	27 10	26 8	23 2	22 4	20 5	17 1	16 3
Mar. 5 ...	27 0	25 3	28 8	26 8	23 1	22 6	20 5	17 1	16 5
,, 12 ...	27 1	25 1	29 1	26 6	22 10	22 5	20 6	17 0	16 8
,, 19 ...	27 1	25 1	28 6	26 4	22 9	22 9	20 6	16 10	16 7
,, 26 ...	27 2	25 2	28 2	27 2	22 4	22 8	20 7	17 0	16 7
Apl. 2 ...	27 3	25 3	27 11	26 5	22 6	22 10	20 6	17 0	16 6
,, 9 ...	27 5	25 4	27 10	26 7	21 10	22 5	21 0	17 2	16 5
,, 16 ...	27 7	25 6	27 9	27 1	21 6	22 6	21 1	17 3	16 4
,, 23 ...	28 9	26 1	27 9	26 5	21 9	22 0	21 6	17 9	16 4
,, 30 ...	29 9	26 10	27 8	27 5	22 1	21 1	21 10	18 0	16 3
May 7 ...	30 9	27 6	27 4	26 10	21 10	20 8	22 6	18 2	16 7
,, 14 ...	31 1	27 9	27 1	25 3	22 5	19 10	22 5	18 4	16 6
,, 21 ...	31 6	27 10	26 9	25 4	23 7	20 4	22 6	18 5	16 7
,, 28 ...	31 6	27 8	26 9	25 1	23 7	19 8	22 10	18 5	16 7
June 4 ...	31 3	27 6	26 10	24 3	23 10	18 8	22 11	18 4	16 8
,, 11 ...	30 11	27 8	26 6	23 8	21 5	18 5	22 8	18 7	16 10
,, 18 ...	30 6	27 6	26 5	23 5	20 7	18 2	23 0	18 3	16 8
,, 25 ...	30 5	27 6	26 5	24 3	22 0	19 2	22 9	18 6	16 10
July 2 ...	30 8	27 9	26 4	25 5	20 7	18 8	22 5	18 6	17 1
,, 9 ...	30 10	28 1	26 6	24 8	19 11	19 8	22 10	18 3	17 1
,, 16 ...	30 11	28 3	26 10	23 8	20 5	18 9	22 10	18 7	17 6
,, 23 ...	31 5	28 7	27 7	25 0	20 10	18 10	22 8	18 5	17 6
,, 30 ...	31 8	28 11	28 0	25 0	21 0	19 9	22 10	18 6	17 10
Aug. 6 ...	31 7	29 3	28 3	24 11	20 1	19 9	22 11	18 8	17 10
,, 13 ...	31 7	29 11	28 4	24 9	21 3	19 9	22 2	18 10	17 7
,, 20 ...	31 5	29 9	28 8	22 10	20 4	22 5	21 11	18 6	16 7
,, 27 ...	31 7	30 0	29 5	26 2	22 3	23 2	21 0	18 7	16 5
Sept. 3 ...	29 9	30 3	30 2	24 6	22 5	25 3	19 10	18 5	16 3
,, 10 ...	27 10	28 6	30 0	27 5	22 4	24 10	19 2	17 0	16 1
,, 17 ...	27 1	27 5	29 7	26 4	24 2	24 9	18 4	16 4	15 11
,, 24 ...	26 6	27 0	29 10	26 4	24 0	25 10	18 0	16 2	15 9
Oct. 1 ...	25 10	26 3	29 10	25 11	23 9	25 5	17 5	15 9	15 8
,, 8 ...	25 5	25 10	30 2	26 2	23 8	25 6	17 2	15 6	15 9
,, 15 ...	25 1	25 8	30 5	26 1	23 9	25 4	17 0	15 5	15 8
,, 22 ...	24 11	25 10	30 4	26 4	23 7	25 5	17 0	15 8	15 11
,, 29 ...	25 0	26 0	30 6	26 7	24 2	24 11	17 3	15 8	15 10
Nov. 5 ...	25 1	26 4	30 6	26 3	24 3	25 0	17 2	15 9	16 0
,, 12 ...	25 0	26 6	30 3	25 11	24 6	24 6	17 3	15 9	15 11
,, 19 ...	24 11	26 9	30 2	25 6	24 3	24 5	17 2	15 10	16 0
,, 26 ...	25 0	26 6	30 5	24 11	23 11	24 4	17 0	15 11	16 1
Dec. 3 ...	25 1	26 8	30 4	24 4	23 9	24 6	17 0	15 9	16 2
,, 10 ...	25 0	26 7	30 4	24 3	23 2	24 4	16 10	15 9	16 2
,, 17 ...	24 10	26 9	30 4	24 2	23 0	24 4	16 10	15 7	16 2
,, 24 ...	24 10	26 5	30 3	24 1	22 5	24 7	16 8	15 6	16 1
,, 31 ...	25 0	26 3	30 4	23 11	22 1	24 8	16 10	15 5	16 2

AVERAGE PRICES of **Wheat, Barley, and Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1903.	1904.	1903.	1904.	1903.	1904.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	November ...	36 1	39 1	22 5	23 1	16 10	17 8
	December ...	35 8	39 10	22 5	23 4	16 9	18 1
Paris:	November ...	35 5	40 4	22 5	23 3	17 4	19 1
	December ...	35 2	41 1	22 2	23 10	17 0	19 3
Belgium:	October ...	27 11	31 6	22 1	23 0	15 9	19 9
	November ...	28 7	31 4	21 6	22 9	15 5	21 6
Berlin:	October ...	34 3	38 9	—	—	18 6	19 7
	November ...	34 9	38 6	—	—	18 7	20 0
Breslau:	October ...	33 4	36 7	23 2	25 7	16 7	18 5
	November ...	33 8	36 6	23 2	25 7	16 7	18 6

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets.*

AVERAGE PRICES of **British Wheat, Barley** and **Oats** at certain Markets during the Month of December, 1903 and 1904.

—	Wheat.		Barley.		Oats.	
	1903.	1904.	1903.	1904.	1903.	1904.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	27 0	31 0	22 6	23 10	16 1	17 0
Norwich	27 1	30 4	21 5	24 8	14 9	15 8
Peterborough ...	25 4	30 0	21 2	23 6	14 7	15 10
Lincoln	25 8	30 2	23 4	22 11	15 2	15 10
Doncaster	25 9	29 8	24 6	23 6	15 9	15 7
Salisbury	26 8	29 0	22 5	23 11	15 10	15 11

CORN PRICES:—ANNUAL AVERAGES.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Weekly Averages of Corn Returns from the Returning Markets, together with the QUANTITIES returned as sold at such Markets during each of the years 1898 to 1904.

YEARS.	PRICES.			QUANTITIES.		
	Wheat.	Barley.	Oats.	Wheat.	Barley.	Oats.
	s. d.	s. d.	s. d.	*Quarters.*	*Quarters.*	*Quarters.*
1898 ...	34 0	27 2	18 5	2,602,416	3,653,657	688,064
1899 ...	25 8	25 7	17 0	3,530,961	3,296,744	776,361
1900 ...	26 11	24 11	17 7	2,923,483	3,190,793	711,784
1901 ...	26 9	25 2	18 5	2,605,550	3,369,629	714,215
1902 ...	28 1	25 8	20 2	2,247,937	2,783,424	831,285
1903 ...	26 9	22 8	17 2	2,296,723	2,875,749	1,049,995
1904 ...	28 4	22 4	16 4	2,138,142	3,437,176	1,316,516

AVERAGE VALUE per IMPERIAL QUARTER OF WHEAT IMPORTED into the UNITED KINGDOM from the under-mentioned Foreign Countries and British Possessions in the years 1902, 1903, and 1904.

Countries from which Exported.	Average Value per Imperial Quarter.		
	1902.	1903.	1904.
	s. d.	s. d.	s. d.
Argentine Republic	29 1	28 6	30 1
Chile	29 0	30 0	30 8
Germany	28 3	29 2	31 2
Bulgaria	25 3	27 3	—
Roumania	27 6	28 10	29 5
Russia	28 2	29 0	30 9
Turkey	25 11	26 9	25 4
U.S. of America, Atlantic ...	28 5	29 9	30 7
U.S. of America, Pacific... ...	29 4	30 5	30 8
India, British	28 6	28 5	28 7
North America, British	28 9	29 8	30 10
Australia	30 5	—	31 4
New Zealand	29 6	—	29 7

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of December, 1904.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British	15 0	12 10	—	—	—	—	15 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	106 0	105 0	115 0	110 4	—	—	114 5	109 7
Danish ...	116 5	114 2	120 2	116 5	118 7	116 0	118 8	—
Russian ...	97 2	94 0	—	—	93 0	88 0	96 0	88 0
Australian ...	102 10	100 10	105 6	102 9	104 10	101 10	106 0	102 0
New Zealand...	103 7	101 2	106 0	103 0	106 5	102 5	106 10	104 0
Canadian ...	100 0	98 0	104 0	100 0	104 5	96 0	—	—
CHEESE :—								
British Cheddar	70 10	62 5	—	—	68 0	62 0	58 0	54 0
			120 lb.	120 lb.	120 lb.	120 lb.		
,, Cheshire	—	—	71 11	63 0	70 0	65 0	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	51 2	49 7	51 8	49 2	50 11	48 7	51 7	48 0
BACON :—								
Irish	51 2	47 0	50 5	47 5	51 10	49 10	53 5	49 10
Canadian ...	43 0	41 2	46 0	42 10	44 1	42 5	44 7	42 10
HAMS :—								
Cumberland ...	95 7	80 0	—	—	—	—	—	—
Irish	96 0	80 0	—	—	—	—	82 0	72 0
American ...	50 7	46 7	46 2	43 0	44 10	41 2	46 10	43 10
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	20 0	15 5	—	—	—	—	—	—
Irish	18 7	15 10	15 0	13 6	14 6	13 1	15 1	13 7
Danish ...	17 5	15 2	13 3	11 11	14 8	13 5	15 3	13 1
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Blackland ...	59 0	51 0	44 6	40 0	45 0	40 0	—	—
British Queen	67 0	60 0	—	—	—	—	55 0	45 0
Up to Date ...	71 0	60 0	75 0	47 6	46 8	38 4	49 0	43 6
HAY :—								
Clover... ...	81 0	64 6	82 0	66 6	80 0	70 0	70 0	65 0
Meadow ...	79 0	60 0	60 0	54 0	57 6	45 0	—	—

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	DECEMBER.		12 MONTHS ENDED DECEMBER.	
	1904.	1903.	1904.	1903.
Swine-Fever :—				
Outbreaks	56	99	1,196	1,478
Swine Slaughtered as diseased or exposed to infection ...	260	631	5,603	7,933
Anthrax :—				
Outbreaks	121	71	1,053	767
Animals attacked	175	100	1,570	1,143
Glanders (including Farcy) :—				
Outbreaks	108	94	1,535	1,456
Animals attacked	162	155	2,658	2,499
Sheep-Scab :—				
Outbreaks	197	395	1,286	1,833

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	DECEMBER.		12 MONTHS ENDED DECEMBER.	
	1904.	1903.	1904.	1903.
Swine-Fever :—				
Outbreaks	2	6	182	172
Swine Slaughtered as diseased or exposed to infection ...	42	434	4,144	4,307
Anthrax :—				
Outbreaks	—	1	4	4
Animals attacked	—	1	7	11
Glanders (including Farcy) :—				
Outbreaks	—	—	11	4
Animals attacked	—	1	34	6
Rabies (number of cases) :—				
Dogs	—	—	—	2
Sheep-Scab :—				
Outbreaks	*33	*99	*424	*545

* These figures refer to November, and to the periods ending November, respectively.

BOARD OF AGRICULTURE AND FISHERIES.

A Return of Market Prices of Fat and Store Stock, Dairy Cattle, Meat, Provisions, Fruit, Vegetables, Hay and Straw at certain representative Markets in Great Britain is issued *every Wednesday* by the Board of Agriculture and Fisheries, containing information for the week ending with the previous Saturday.

Price *One Penny* per copy, to be obtained either directly or through any bookseller, from Eyre & Spottiswoode, East Harding Street, E.C.; Oliver & Boyd, Edinburgh; or E. Ponsonby, 116, Grafton Street, Dublin.

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THE JOURNAL
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SPRAYING FRUIT TREES AND BUSHES.

Unless the prevalence of the insect and fungoid pests of fruit trees and bushes has greatly increased, it is difficult to imagine how any success could be attained in fruit-growing before spraying came into use. The common impression is that the prevalence of these pests has increased greatly ; but this may possibly mean only that they are now observed more than they were formerly. At any rate it is certain that nowadays it is only by a rare chance that an uninjured crop of tree or bush fruit can be obtained without spraying. This is particularly the case with apples and pears, which appear to be more preyed upon than any other kind of fruit by pests that are seriously injurious.

Some years ago the plan of grease-banding fruit trees, to catch the females of the winter moth and some other varieties, came extensively into use. The bands require to be renewed from time to time, and unless this is carefully done it will not entirely prevent the females of the winter moth from getting on to the trees, while it is of no considerable use in relation to other pests. It does not, therefore, supersede the necessity of spraying, and as it is a somewhat expensive operation, and one that may be injurious to trees unless great care is taken, some growers of fruit have come to the conclusion that grease-banding may be discarded, and spraying alone practised.

Perhaps the strawberry needs spraying less than any other fruit, and yet the crop often suffers seriously from the strawberry-leaf spot (*Sphærella fragariæ*), for which Bordeaux mixture is a preventive, if used as soon as the leaves open, and again at intervals. The ground beetles which prey upon the fruit of

strawberries are not open to destruction by spraying; but the strawberry-leaf beetle (*Galeruca tenella*) may have its food poisoned after the fruit has been gathered. This beetle does not appear until after the fruit is formed, when spraying with a poisonous solution cannot be done with safety.

Raspberries are rarely sprayed, if ever; yet they should be treated with diluted Bordeaux mixture or potassium sulphide whenever the fungus, raspberry rust (*Phragmidium rubi-idæi*), shows in small yellow or greenish-yellow spots on the leaves; also when the small reddish spots of the fungus, raspberry spot (*Gloeosporium venetum*), appear on the canes or young leaves. Mr. George Massee, to whose excellent *Text Book of Plant Diseases* (Duckworth & Co.) the present writer is much indebted also advises the spraying of the new canes with a solution of 2 lb. of sulphate of iron in five gallons of water when the old canes have been removed. As to insect pests, both the raspberry beetle (*Byturus tomentosus*) and the raspberry stem-bud moth lay their eggs in the blossom, and therefore it is possible that spraying with a poisonous wash would be as effectual if done just after the petals have fallen, as it is against the caterpillars of the codlin moth in the case of the apple. The raspberry fruit, however, forms and ripens so quickly that there might be danger in the application of a strong poison, such as Paris green, however much diluted. But it may be suggested that a strong-smelling spray, such as potassium sulphide, might possibly deter both pests from depositing their eggs on the treated bushes if used just before the blossom buds open, when it might also serve as a preventive to the fungoid diseases named above.

Pursuing the plan of noticing varieties of fruit which need to be treated separately, before referring to those which, it will be suggested, might be dealt with on a common method, the highly-injurious fungoid disease known as peach-leaf curl (*Exoascus deformans*) demands attention. From experience the effectiveness of spraying with Bordeaux mixture as a preventive of this disease can be affirmed with confidence. The peach trees in the writer's garden suffered repeatedly before this preventive was tried, whereas they have since been almost entirely free from the malady. The plan pursued was that of spraying with Bordeaux mixture just before the leaf-buds opened, and a second

time after the leaves were showing, about three weeks later. The strength* used for the first spraying was 1 lb. of sulphate of copper and 1 lb. of quicklime to ten gallons of water; and for the second operation, on account of the tenderness of the foliage, it was just half this strength. It is usual to put less lime than copper sulphate in Bordeaux mixture, but for safety an equal quantity may be recommended.

The gooseberry is mentioned by itself because the use of a spray to prevent the destruction of buds by birds during the winter takes the place of the caustic winter wash to be prescribed for other bush fruit as well as trees. Previous to the winter of 1903–4, my gooseberry bushes were half denuded of their buds by birds, the result being not only a serious loss of fruit, but also the deformation of the bushes. Spinning a web of fine cotton over the bushes, by means of a handy tool known as Royle's threader, proved ineffective as a preventive; but a wash recommended in Wright's *Fruit Growers' Guide* appeared to be perfectly satisfactory, no buds being picked off. The wash is a mixture of flowers of sulphur, quicklime, and soft soap in the following proportions:—50 lb. of sulphur, 200 lb. of lime, and 75 lb. of soft soap in 150 gallons of water. The method of preparation described below must be carefully followed, as it is necessary to have the sulphur dissolved, as far as it can be, by the slaking action of the lime. A few lumps of quicklime are placed in a tub, boiling water enough to slake them being poured on. Then a little sulphur is dusted over the lime, next more lime, hot water, and sulphur, and so on until the sulphur is dissolved. If a little more or less than the prescribed quantity of lime be used in the process, it is of no consequence. Where there are facilities for boiling the lime and sulphur, it would be better to boil them together for at least an hour. The soft soap is separately dissolved in boiling water, or by boiling it, and added to the other ingredients of the mixture. Account must be kept of the quantity of water used in the slaking of the lime and the dissolving of the soft soap, in order that the quantity to be added afterwards may be known. The process is a very slow and

* The strength recommended in the Board's leaflet on "Peach Leaf Curl" (No. 120) is 2 lb. of copper sulphate, 1 lb. of lime to 10 gallons of water.

troublesome one, and it is very difficult to get the sulphur so thoroughly dissolved that it will not clog the nozzles of a spraying machine. The whole must be strained through a sieve of the finest wire gauze as the mixture is being made, and when diluted for passing into the spraying machine, it should be strained again into the machine. It is quite possible that more than the prescribed quantity of water may be found necessary, unless the nozzles of the machine are extra coarse: up to 200 gallons will leave a fair coating on the bushes. Now the lime and sulphur, if the latter be properly dissolved, form calcium sulphide mainly, with other compounds, and as this compound can be obtained of wholesale chemists in liquid form, a trial of it was made this season. Unfortunately, the addition of soft soap brought the sulphur out of the combination, and caused much trouble in spraying. The explanation is that the potash in soft soap is a more powerful alkali than lime. This suggested a trial of potassium sulphide ("liver of sulphur"), which will go well with soft soap, the results of which remain to be seen. For an experiment on a small scale the ingredients were: 3 oz. of potassium sulphide, 3 lb. of soft soap, and one-sixteenth of a pint of linseed oil to 3 gallons of water. Possibly half the quantity of soft soap would have sufficed.

The spraying of gooseberry bushes should be done at least as soon as any buds are found to have been picked off. It is desirable to defer the work as long as it is safe to do so, in order that one spraying of this kind may serve for the season; but as it cannot be done in a frost, and much mischief might be done by birds in a prolonged period of severe weather, it is hardly safe to defer it later than the last week of December.

Where birds are troublesome in picking off the buds of plums, pears, cob-nuts, or filberts, the treatment recommended for gooseberries will be equally applicable.

With respect to insect and fungoid pests, the fruit-grower is perplexed at the preventives and remedies suggested to him. In text-books on the subject he finds from three to six sprayings proposed for one pest and as many for another; and, as applications to prevent as well as to cure attacks are recommended, and the pests are multitudinous in variety, he is apt

to think that he would have no time for any other work than spraying if he followed the advice given to him. Now, spraying is a very troublesome and unpleasant operation, and not by any means an inexpensive one. Therefore too many growers of fruit aghast at the multitude of operations apparently recommended neglect to spray at all. A careful study of the preventives and cures recommended, however, will show that a great many pests may be combated in the same operation.

It is suggested that four sprayings in the season would suffice as a rule to prevent or check all the ordinary insect and fungoid attacks upon fruit trees and bushes. The first is the application of caustic soda and potash wash in February; the second is a spraying with Bordeaux mixture and Paris green just before the buds open; the third is the use of the same mixture just after the petals of the blossoms have fallen; and the fourth is the same treatment when the foliage is fully mature and the fruit is partly grown.

The first is of great importance, as it clears the trees and bushes of moss and lichen, is very effective against American blight, may even check canker to some extent, and is destructive to scale and hibernating insects, and, in some degree, to their eggs, while it probably destroys the spores of some kinds of fungi. It may be applied to all kinds of fruit trees and bushes when the leaf and fruit buds are dormant; only where gooseberry bushes have been treated with the lime, sulphur, and soft soap wash, or any substitute that may prove equally effective against the depredations of birds, it is probably not necessary. Its application is usually recommended at about the middle of February, as that period is believed to be the one in which it will prove most destructive to insects. In some seasons, however, this might be somewhat late for black currants, as the buds would be getting too forward.

The ingredients are 1 lb. of caustic soda and 1 lb. of crude potash to 10 gallons of water.* It has been used in much greater strength where buds were dormant without the slightest apparent injury. Caustic soda in lumps, 70 per cent. actual

* In the Board's leaflet on the "Winter Washing of Fruit Trees" (No. 70), it is recommended that the soda and potash should be dissolved in water and ¾ lb. of soft soap or agricultural treacle added before making up the mixture to 10 gallons.

caustic, can be bought of a wholesale chemist for about 17s. per cwt.; and caustic potash, also in lumps, 73 to 75 per cent. actual caustic, at about 33s. 6d. per cwt. The percentages of hydrated caustic, commonly quoted, would be much higher. The lumps, however, take a long time to dissolve, and the only quick method is that of boiling them. Not more than 7 lb. should be boiled in two gallons of water in a vessel holding at least three gallons. It must not be nearly full, for if it is the liquid will boil over, as it expands violently when it reaches the boiling point. The materials can be obtained in powder at a slightly higher price.

The strength of the other mixture recommended is 8 lb. of copper sulphate, 8 lb. of quicklime, and 8 oz. of Paris green paste to 100 gallons of water when foliage is in a tender condition, and 10 lb. of copper sulphate, 10 lb. of quicklime, and 10 oz. of Paris green to 100 gallons of water when the foliage is mature. The sulphate should be dissolved with boiling water in a wooden vessel, while the lime is slaked and liquefied in another, after which the latter can be strained through a sieve of fine white gauze into the former, while the Paris green should be dissolved separately and well mixed with the other ingredients. The whole should be strained again into the spraying machine, the pump of which, moreover, should always have a strainer fixed over its suction tube.

When equal quantities of copper sulphate and lime are used, there is no need to test the mixture for acidity, provided that fresh quicklime be used. The copper sulphate should be guaranteed at 98 per cent. of purity.

As the first of these sprayings with Bordeaux mixture is chiefly for the prevention of fungoid attacks, it might be supposed that Paris green is not required. There is reason, however, to hope that it will prevent or check the operations of the bud moth, and other pests which attack buds. The object of combining Paris green and the Bordeaux mixture is that of at once poisoning the food of insects or their larvæ, and destroying the spores of fungi. It is well worth while, then, to include the Paris green in the first of the spring sprayings. The combination has proved remarkably successful in Canada and the United States, and one advantage of it is

that the burning effect of Paris green alone is prevented by the other ingredients if used in moderate strength.

The next spraying would be directed to the poisoning of the food of the caterpillars of the codlin moth, the apple sawfly, and leaf-eating pests generally, while also destroying fungoid germs. The last spraying would poison the food of leaf-eaters again, and check or stop fungoid attacks.

Should an attack of aphides have persisted in spite of these three sprayings with Bordeaux mixture and Paris green, an extra spraying with 6 lb. of quassia chips, boiled gently for an hour, and 10 lb. of soft soap in 100 gallons of water should be applied. The damage done by a persistent and prolonged attack of aphis last season in plantations of apples and plums was extremely serious. Not only was the foliage curled and blighted, but the young shoots also were twisted, especially among plums, while the vitality of leaf and fruit buds alike was badly impaired. Some trees were almost ruined by the aphis blight, and others will require fully another season for recovery. It is of comparatively little use to apply the quassia and soft soap wash after the aphides have become curled up in leaves, so that timely application is essential to success.

It is important to bear in mind the fact that Bordeaux mixture should be used immediately after it is prepared. Some authorities state that it does not keep good for more than forty-eight hours.

The insect and fungoid attacks which could probably be dealt with with more or less success by the four sprayings recommended, including the winter spraying, are as follows :—

APPLES.

Insects.—Woolly aphis, scale, bud moth, apple sucker, codlin moth, apple sawfly, aphis, apple blossom weevil, winter moth, and leaf-eating pests generally.

Fungi.—Canker, apple scab, apple rot, and brown rot.

PLUMS.

Insects.—Plum sawfly, aphis, winter moth, mottled umber moth, and other leaf eaters.

Fungi.—Leaf blight, plum leaf blister, brown rot, plum scab, and Australian shot-hole fungus.

PEARS.

Insects.—Sawfly slugworm, aphis, pear midge (doubtful), and most of the insect pests common to the apple.

Fungi.—Leaf blight, leaf blister, rust, scab, and brown rot.

CHERRIES.

Insects.—Sawfly slugworm, aphis, and leaf-eating caterpillars generally.

Fungi.—Leaf blight, rust, powdery mildew, and leaf spot.

GOOSEBERRIES.

Insects.—Scale, sawfly, and leaf-eaters generally.

Fungi.—Leaf spot and mildew.

CURRANTS.

Insects.—Scale, currant shoot and fruit moth, currant clear-wing moth, aphis, sawfly, and other leaf-eaters.

Fungus.—Leaf spot.

It will be understood that the term "insects" is not strictly applied, but is used for the animal pests generally; also that it is the larvæ of the insects to which reference is intended in most instances. It is not necessary to name all the leaf-eating caterpillars, which are very numerous.

There is one difficulty in using poisonous spray in mixed plantations of top and bottom fruit. No fruit should be sprayed with Paris green after it is more than half grown. In America apples are sprayed with this poison nearly up to the time of picking, and it is stated that no harm has been proved to have resulted. There must be some danger, however, in dry seasons in spraying nearly mature fruit with poison. It is easy to avoid this risk when any individual fruit alone is in question; but the question is whether gooseberries or currants, and particularly the former, if grown among apple or plum trees, might not be too far advanced when the last of the sprayings recommended had to be applied. In that case, as some of the spray would be certain to fall upon them, there would be some danger to consumers, and it would be necessary to omit the Paris green. Or, where there are gooseberries, the last spraying of apples or plums with poison, to kill leaf-eating caterpillars, might be done before the foliage was quite fully expanded, leaving a fifth spraying, without Paris

green, to be carried out if necessary to check a bad attack of scab.

As to the gooseberry bushes, considered by themselves, it unfortunately happens that their worst pest, the sawfly caterpillar, is most commonly prevalent when the fruit is almost fully grown. Possibly this would not be the case if the bushes were sprayed with Bordeaux mixture or Paris green when the fruit was not more than half-grown. At any rate they should then be treated with poison for the last time, after which, if any caterpillars are present, a wash of hellebore may be applied.

One of the worst attacks on the gooseberry is that of the mite known as the red spider (*Bryobia prætiosa* or *Bryobia ribis*), an extremely difficult pest to get rid of, because the eggs are not destroyed by applications fatal to the spider. Paraffin emulsion is said to kill the pest; but it is not likely to destroy the vitality of the eggs. There seems to be a better chance of clearing the bushes of the mite by poisoning its food, so that spiders hatched after the spraying would be killed as well as those alive at the time. As this is not certain, no claim is made for the wash recommended above in this respect.

The formula for paraffin emulsion recommended in the Board's leaflet (No. 16) is 6 lb. of soft soap, 4 gallons of paraffin, and 100 gallons of water. The soap should be boiled in a small quantity of water, and the paraffin put into it while boiling hot, but off the fire, and then stirred together rapidly, or passed through a syringe or force-pump in order to incorporate them thoroughly. This mixture may be diluted afterwards in the proper proportion.

This wash is effective for aphides, and even for young caterpillars, and it has been recommended by Mr. F. V. Theobald for use in the autumn, after fruit has been gathered, to kill aphis and apple suckers before they lay eggs.

One of the most destructive pests of apples, and occasionally of pears, is the pith moth (*Laverna atra*), the larvæ of which tunnel into the shoots, chiefly at the ends, but also under buds lower down. This pest would not be destroyed by the series of sprayings recommended above, and therefore, where it is prevalent, an extra spraying of Paris green may be tried. No experience appears to have been obtained in this

connection, but Mr. Theobald, who has made a special study of the pith moth, suggests that a poisonous spray applied immediately after the gathering of the fruit might kill many of the young larvæ, which are said to feed on the leaves of apple trees in the autumn.

WILLIAM E. BEAR.

INJURIOUS AND BENEFICIAL SLUGS AND SNAILS.—II.

Snails (*Helicidæ*) do not do so much harm in the field as slugs, but now and again they attack young wheat to a serious extent. Snail attacks mostly seem to occur along "Down-sides." In gardens, however, much harm is often done by these mollusca, not only to flowers and choice vegetables but also to strawberries. As they feed entirely above-ground, they can be much more easily destroyed than the slugs. All the chief injurious snails belong to the genus *Helix*, and have a large shell, whorled in form, with a large opening into which the snail can entirely withdraw its body. The opening or mouth can be closed with a hardened plate formed by the foot of the mollusc, called the epiphragm. This epiphragm is particularly well developed in the common garden snail (*Helix aspersa*), which, during the winter, withdraws into its shell and closes it with a brown horny plate. Many of these snails collect together in a mass, and become united to one another's shells by these horny structures. Two snails thus united are shown in the plate.

Almost every wood and hedge, field and garden yields one or more species of *Helix*. Some are partial to the sand dunes near the sea, others to Downs, or to water-courses and damp places. Like slugs, they are mainly crepuscular and nocturnal, but may appear in damp weather and after showers during daylight. This has given rise to the popular idea that snails come in rain clouds.

The following snails have been brought to my notice as being injurious.

(1). THE GARDEN SNAIL (*Helix aspersa.* Müller).

This is one of the commonest species, and is that most often complained about in gardens, where it devours the choicest plants and vegetables. It often becomes a serious pest to wall fruit, especially in old gardens, and several cases of the complete destruction not only of leafage but also blossom have been observed. The years 1884 and 1889 were remarkable for the great numbers of this snail; they also appeared in abnormal numbers in some districts during 1904.

The garden snail is one of the largest species, and can at once be recognised by its brown colour and pale zig-zag lines across the

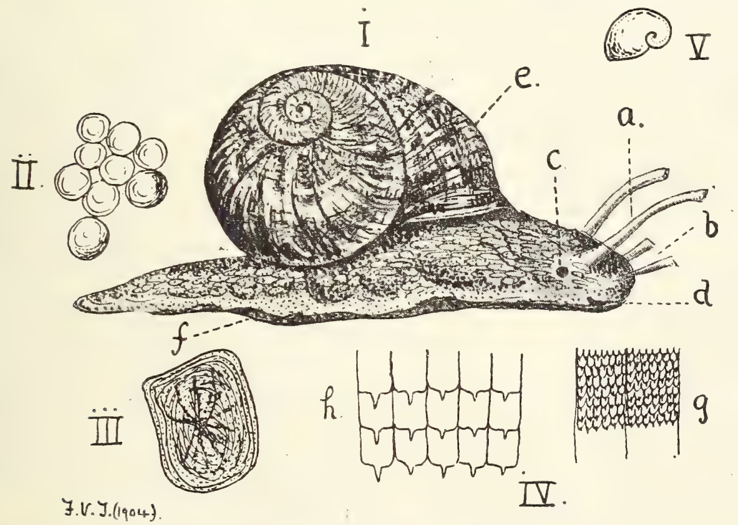


FIG. 1.—THE GARDEN SNAIL (*Helix aspersa*).
I. Mature snail; *a*, large, and *b*, small tentacles; *c*, genital aperture; *d*, mouth; *e*, shell; *f*, foot. II. Eggs. III. Epiphragm. IV. Part of radula; *g*, a piece enlarged; *h*, teeth further enlarged. V. Young snail.

shell from the apex of the spire to the base. These snails may reach nearly an inch and a-half in height, but are usually less. Eggs are laid in small batches in the earth, about sixty to seventy in each heap; they are white, shining, globular bodies, which hatch in about fifteen days. The young snail has a thin and transparent shell, but grows rapidly. At the approach of cold weather these snails collect together in heaps amongst dead leaves, in rockeries, amongst the exposed gnarled roots of trees, &c. Here they remain, often united, as stated above, in large masses by means of the epiphragms. They come out from these

shelters in spring and commence to devour the nearest tender leaves.

(2). THE WOOD SNAIL (*Helix nemoralis.* Linn.).

This is about the first snail to make its first appearance in the spring, and it has been found crawling about even in February. It is abundant in hedgerows and upland pastures, and especially amongst clover, sainfoin, and lucerne, where it does much damage at times. It will also eat any other vegetation, and even meat. The colour of the shell of this snail is very variable, being white, grey, pale yellow, pink, or brown, with one to five spiral brown bands. Now and then the bands may be confluent or interrupted; there are normally $5\frac{1}{2}$ whorls, the last being three-fifths of the shell. The live mollusc is brown, tinged with yellow, and covered with small tubercles, with a greenish mantle with yellow specks, and long, slender tentacles. The lip surrounding the mouth is black.

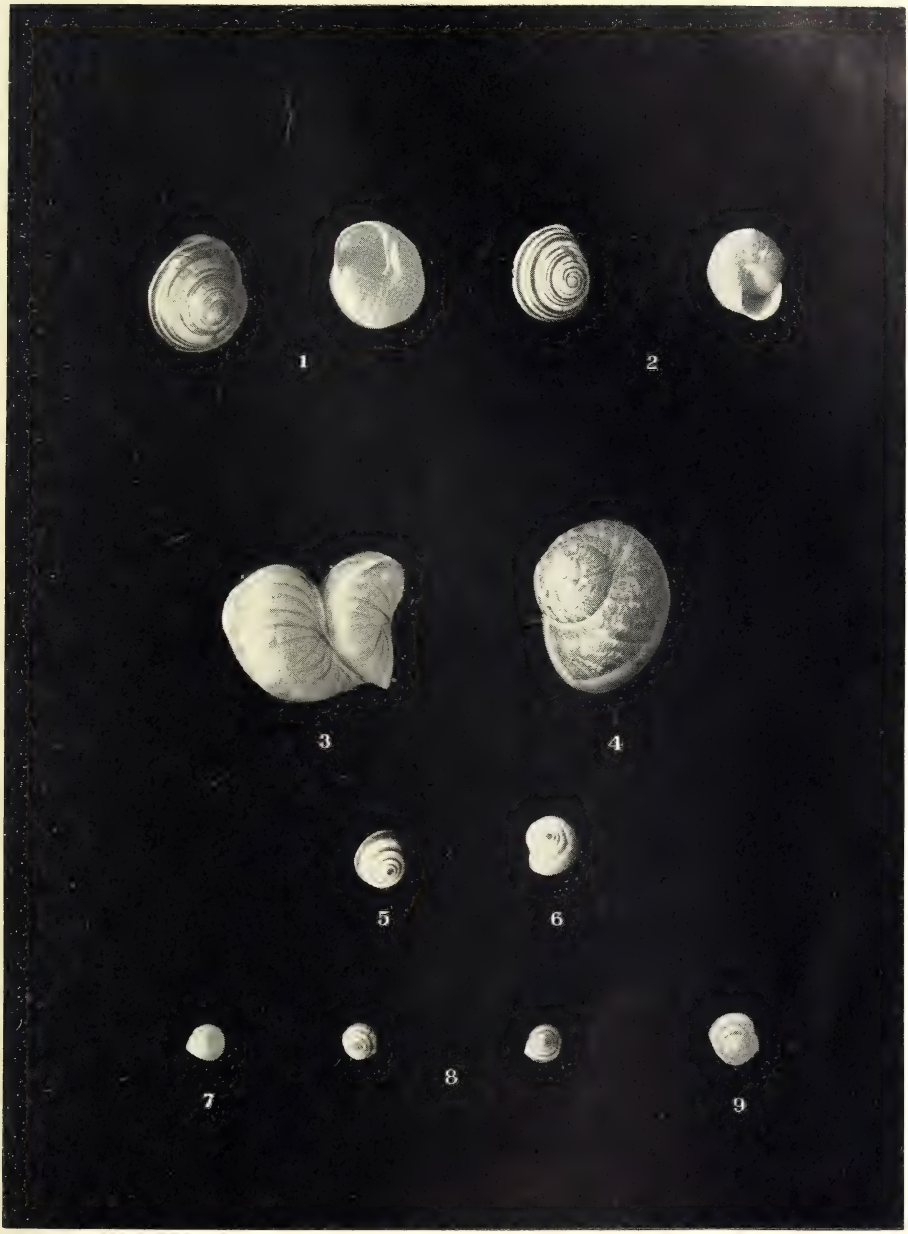
(3). THE ALLIED WOOD SNAIL (*Helix hortensis.* Müller).

This can at once be distinguished from the former by the lip being white, not black. It occurs in the same localities, and some authorities consider it to be a variety of the wood snail.

(4). THE STRAWBERRY SNAIL (*Helix rufescens.* Pennant).

This small snail is one of the worst pests in the garden, and occurs in all parts from Westmorland to Cornwall; it is a frequent source of annoyance in strawberry beds and amongst violets. Iris and other garden plants and vegetables are frequently stripped, and beds of strawberries have been quite spoiled by them. This snail is seldom as much as half an inch long. The shell is compressed above and angularly rounded below, of an opaque dirty grey, reddish-brown colour, or brown marked with a white spiral band which passes around the last whorl, transversely streaked with brown; the number of whorls varies from six to seven, and the last whorl equals about half the shell. The snail is yellowish-brown, with dark brown stripes running along the neck and on the tentacles, and the foot is pale, narrow, and slender.

The strawberry snail never goes out in the daytime except after rain. A single specimen may lay from forty to sixty eggs



SOME INJURIOUS SNAILS (REDUCED $\frac{1}{3}$).

1. THE WOOD SNAIL (*Helix nemoralis*).
2. ALLIED WOOD SNAIL (*H. hortensis*).
3. GARDEN SNAILS (*H. aspersa*), ATTACHED BY EPIPHRAGM.
4. GARDEN SNAIL (*H. aspersa*)
5. DOWN SNAIL (*Helix Virgata*).
6. *Helix caperata.*
7. THE HAIRY SNAIL (*H. hispida*).
8. *Helix rotundata.*
9. STRAWBERRY SNAIL (*Helix rufescens*)

between August and November; they are laid in heaps in the ground or sometimes on the ground; generally they hatch in from twenty-one to twenty-five days, but a few may remain undeveloped until the spring. These little snails hibernate in all manner of places, being especially fond of ivy-covered walls. Where strawberries have been attacked the snails frequently shelter during the day under the straw put between the rows.

(5). THE SMALL BANDED SNAIL (*Helix virgata.* Da Costa).

During 1894 this snail was observed to do much harm in Kent and in many other parts of Britain. It causes considerable loss amongst root crops and has been known to damage grass lands. In one attack on the farm belonging to the South-Eastern Agricultural College, this snail was observed to come down in great numbers from the Downs during wet weather, when it attacked and did much damage to mustard, as well as to wheat. It is an extremely abundant species and is gregarious, and may often be seen swarming over herbs and bushes in wet weather. In dry weather it retires and hides amongst rough herbage, &c., where it remains until rains come. In dry weather I have seen this snail blown about by the wind and rolled along "down sides," and on sand dunes quite a distance. It is at times a very ravenous feeder. The idea still exists in some parts of England that this snail imparts a fine flavour to mutton, and is a nutritious food for sheep.

The shell is conical, with a broad and convex base, creamy-white or white with a single purplish-brown band above the periphery, and sometimes as many as six or seven below it, more often two or three. Now and then the dark bands are broken so as to make the shells appear spotted; there are six whorls, the last equalling half the shell; the mouth is purplish inside, with a strong rib, sometimes purple, at other times white. The body of the snail is dusky grey, with coarse tubercles; the mantle is dark violet, speckled with white and brown.

The eggs are laid from September to December in clusters of three or four amongst the herbage or in crevices. The small banded snail seems to care little for the cold, for it has been found active in mid-winter. In very cold weather it merely forms a thin glassy epiphragm, which it may also do in very

dry summer weather. In fact, it never seems actually to hibernate.

(6). THE ALLIED BANDED SNAIL (*Helix caperata.* Montagu).

This small snail differs from the former in its smaller size, its depressed spire, and larger umbilicus, but especially in having numerous rib-like striæ round each whorl.

It is found from Scotland to the Channel Islands, and occurs under stones, wood, &c., in woods and fields, and also on the stalks of grass and other herbage. Now and then numbers may be noticed on low bushes. It especially flourishes near the sea, and in those localities it occurs frequently in gardens. It is often very abundant and harmful in corn-fields, where it has been found attacking not only the leaves but also the developing ears. The round, white, opaque ova are laid in September and October. They are placed in groups, from thirty to forty being produced by each snail. The ova hatch in three weeks and the young snails become adult at the end of the following year.

(7). THE HAIRY SNAIL (*Helix hispida.* Linn.).

This is mainly a pest in gardens and osier beds. It is a small snail ; the shell is thin and semi-transparent, light ashy-grey to yellowish-brown, with here and there faint streaks of brown, giving it a mottled appearanee. The epidermis is thick and clothed with short white hairs ; whorls six to seven, rounded, and moderately convex on both sides, the last whorl equal to about one-third of the shell. It may be found everywhere under stones, moss, grass, logs, boxes, &c., on the ground. It eats the leaves of tender garden plants, especially lilies and others of a succulent nature. The eggs are laid from April to September ; they are globular, white, and opaque. Each snail lays about fifty, and they take from twenty-one to twenty-five days to incubate. The young emerge from the egg with nearly the whole of one whorl formed, and part of this shell is covered with short red hairs.

These are all the snails that occur in sufficient numbers to do damage in field and garden. Others probably do some little

harm now and again, but either they have not been observed, or no record has been made of their depredations.

Natural Enemies of Snails and Slugs.

Birds are the greatest natural check to slugs and snails. Almost all birds will devour slugs, but not many will attack snails. The most beneficial is the thrush, which devours the garden snail, cracking its shell against a stone and picking out the mollusc with its beak. The strawberry snail is also a favourite food of the thrush. One frequently comes across little heaps of the shells in gardens, the sides or spire being broken; these have all been the victims of a thrush. The little hairy snail is also eaten by thrushes, as well as by robins and other birds. The blackbird also eats these mollusca, and many fall a prey to starlings, plovers, and rooks.

Slugs are attacked also by moles and shrew-mice, and by toads, while numbers succumb to the carnivorous Carabid beetles and their larvæ, and occasionally larval Silphidæ will devour them.

Slugs may also be infested with a parasitic mite—*Philodromus limacus*—which swarms over them and stops the formation of slime. Centipedes also attack and kill slugs, while ants are known to kill snails. Both fowls and ducks devour slugs greedily, and the former will eat numbers of snails, even the large *Helix aspersa.*

Prevention and Remedies.

When occurring in large numbers slugs are most difficult to cope with, not only in the field but in the garden. This is due to their being able to excrete slimy mucus immediately an irritant touches them in such quantity that they cast the substance off. This cannot, however, be done indefinitely. Slugs are especially fond of damp situations, and drainage will often lessen their numbers. The mechanical composition of the soil also influences them: a loose open soil favours them, a compact soil is correspondingly unfavourable. I have frequently noticed that slugs are most abundant where an excess of long manure has been used. This should be avoided where slugs are very numerous, and artificial manures used instead for a time.

Dry dressings of many kinds have been used for killing slugs with varying success. Soot, lime, and salt have been most usually employed. A single dressing of soot and ordinary lime or salt and lime does very little good, as the copious flow of mucus takes the effects away. Dry irritant dressings should be applied twice or three times in succession to be of any avail; the second application should be about fifteen minutes to half an hour after the first. The dressings should be given in the early morning or late in the afternoon, or after heavy rains, when the slugs or snails are active. It is useless when the ground is dry and the weather hot, as the slugs cannot be reached, and it must be remembered that the irritant should touch the backs of the slugs. Slugs have been seen resting quietly on soot and ordinary lime not in the least harmed. The lime also must be fresh, and it cannot be too finely triturated.

A very fine hydrate of lime was found not only to act directly by killing all the slugs it actually touched, but to keep them from attacking plants around which it had been spread thickly, and even where sown broadcast over the soil. The sample used was found to be very lasting, remaining white on the ground for four or more weeks after ordinary lime from a neighbouring kiln had been washed away. An analysis of this sample showed that there was some caustic soda in it, and this probably accounted for the marked effect on the slugs. A mixture of ordinary fine slaked-lime, with 4 per cent. of caustic soda added, was made, and this had a similar beneficial effect, even when applied once. This was not found to harm young peas, cabbage, &c., over which it was dusted. Salt at the rate of four to five bushels and lime at the rate of ten to twelve bushels per acre, with the addition of caustic soda, acted in a very similar way. Either of these dressings may be applied in the field broadcast in early morning or late at night.

White hydroxide of calcium in 1 per cent. solution is said to destroy slugs.*

In gardens, slugs may be successfully trapped by placing every here and there small heaps of bran-mash or liquid oatmeal; brewers' grains also answer well for this purpose. These baits

* *U.S. Exp. Sta. Record*, Vol. XII., No. 11, 1901.

will be found to attract large numbers of slugs, which can then be easily collected and put in pails of quick-lime. Good results are said to have been obtained by using ordinary wood-ash, dusted over the infested plants when dew was on the leaf.

Where land has been badly infested with slugs and many young slugs are seen, the soil should be dressed with gas-lime in late autumn, and after six weeks deeply trenched.

Snails are more difficult to deal with on a large scale, but are more affected by soot than slugs. As long as soot is fresh they

FIG. 2.—RUNNER BEANS DEVOURED BY SLUGS.
(*The arrows point to the areas cleared by the slugs, which were not dressed to prevent attack.*)

do not care to crawl over it, and so may be kept away. In gardens hand-picking is by far the best plan. Rockeries and ferneries in gardens are generally centres from which snails spread. All rough herbage on and around these should be cleared off in winter, and the masses of snails collected and destroyed, and the whole dusted with soot in the spring. Seedlings are best protected by heavy borders of lime. Rows of peas, beans, &c., may also be protected by spreading barley-awns or

cinders and lime along the rows. Frequently invasion comes from a neighbouring hedge or wood. When this occurs a trench should be dug and filled with gas-lime or tar to prevent the advance of the mollusca. Thrushes should be encouraged, as they destroy numbers of snails at all times of the year.

Both ducks and fowls do much good in keeping down both classes of these molluscan pests, and should be turned on the land whenever possible during and after an attack—ducks especially where slugs are the culprits, fowls when snails have been in abundance. This would be one of the best ways of clearing a hop-garden of molluscan enemies.

FRED. V. THEOBALD.

SHEEP SCAB.

The Board of Agriculture and Fisheries have issued the following circular to Local Authorities in Great Britain under the Diseases of Animals Acts, 1894 to 1903 :—

4, Whitehall Place, S.W.,
30th January, 1905.

SIR,—I am directed by the Board of Agriculture and Fisheries to advert to the Report of the Departmental Committee appointed by the Board to investigate experimentally and to report upon certain questions connected with the dipping and treatment of sheep (Cd. 2258),* and to the Minutes of Evidence taken before that Committee (Cd. 2259),* and to state, for the information of your Local Authority, that after giving very careful consideration to the recommendations of the Committee, the Board have determined that the time has now arrived for energetic action with a view to bring about the speedy eradication of Sheep Scab in this country.

2. They have accordingly made three Orders relating to this disease, copies of which are herewith enclosed,† and in trans-

* These are Parliamentary Publications, and can be purchased either directly or through any bookseller from Messrs. Wyman & Sons, Limited, Fetter Lane, London, E.C., at the price of 3d. and 2s. 4d. respectively.

† Copies of these Orders, viz., Sheep Scab Order of 1905 (No. 6879), Sheep Scab (Compulsory Dipping Areas) Order of 1905 (No. 6880), and Sheep Scab (Regulation of Movement) Order of 1905 (No. 6881), can be obtained on application.

mitting these Orders to be laid before your Local Authority, the Board desire to offer the following observations, as to the administrative procedure necessary to ensure the success of their proposals and as to the policy underlying their action, which the Board trust will receive the careful consideration of your Local Authority.

SHEEP SCAB ORDER OF 1905 (NO. 6879).

3. This Order does not differ in principle from the Sheep Scab Order of the 13th September, 1898 (No. 5847), which is revoked as from the date of operation of the new Order. Increased powers are, however, placed in the hands of Inspectors, both of the Board and of the Local Authority, as regards the isolation, under Notice (Form C.), of sheep which the Inspector has reason to believe to have been in contact with sheep affected with Sheep Scab, and provision is made for the prompt service by the Inspector of the Local Authority of the Detention Notice (Form A.) as regards suspected sheep, pending the veterinary examination prescribed by Article 3 of the Order.

4. In this connection the Board trust that every Local Authority in Great Britain will make arrangements, in connection with each reported outbreak of Sheep Scab, for the immediate attendance of a Veterinary Inspector of the Local Authority, who, they think, should be instructed that his duty should not be confined to the examination of those sheep only in which disease has been reported as suspected, but should extend to the examination of any other sheep upon the holding, or part of the holding, where the suspected animals are. On the confirmation of the existence of disease by the Veterinary Inspector the fact is to be notified to the Board by the Local Authority. It is hardly open to question that in some districts the number of Veterinary Inspectors employed by the Local Anthority is not sufficient to admit of the thorough investigation of each outbreak in the manner above suggested, and where such is the case the Board hope that steps will at once be taken by the Local Authority concerned to remedy the matter by the appointment of additional Veterinary Inspectors

5. The experience of the Board has been that the purely

executive duties entrusted to Inspectors of a Local Authority are more efficiently and economically performed by the police than by Veterinary Officers, but in districts in which the Local Authority call upon their Veterinary Inspectors to undertake executive duties in addition to duties requiring professional knowledge, the number of Veterinary Surgeons employed must of necessity be larger than would otherwise be requisite. In the opinion of the Board it is of advantage that the police should be appointed as Inspectors of the Local Authority, and that the Chief Constable should in every case be appointed Chief Inspector to the Local Authority.

6. Immediately upon the confirmation of the existence of Sheep Scab by the Veterinary Inspector, the Inspector of the Local Authority should proceed to investigate the history of the outbreak, and to put in force the additional powers now granted to him under Article 5 of the Order as regards the isolation of sheep on the same or other premises which he has reason to believe to have been in contact with sheep affected with Sheep Scab, irrespective of the ownership of the sheep, and in serving the prescribed Notice of Isolation (Form C.), it should be explained to the owner of such sheep that the restrictions on movement thereby imposed will be removed as soon as the animals in question have been thoroughly dipped by, and at the expense of, their owner in an efficient dip in the presence, and to the satisfaction, of an Inspector of the Local Authority. A copy of any such Notice (Form C.) so served should at once be transmitted to the Board by the Inspector. When such sheep have been removed to the district of another Local Authority, the necessary information should be transmitted to that Local Authority in order that they may be in a position to take similar action on the information received.

7. In determining whether or not an Isolation Notice (Form C.) should be served in respect of particular sheep, the Inspector of the Local Authority should take a wider view than has, perhaps, hitherto been customary of the risk of the disease being contracted by sheep which have previously been in association with those in which Sheep Scab has been detected. In all operations against contagious disease in animals the endeavour should be to anticipate outbreaks, and to secure that

all animals which are believed to have been exposed to the risk of infection shall be detained and dealt with. Experience has shown that on such action success largely depends. Moreover, seeing that in connection with Sheep Scab the owner of the sheep can by the process of effectual dipping readily rid himself of any inconvenience caused by such restrictions, no undue hardship is caused by the free resort to this method of dealing with in-contact animals.

8. As regards disinfection, to the efficient carrying out of which there is reason to fear that in many cases due attention has not been given in the past, Article 8 (1) of the Order has been framed so as to secure that in every case such processes of disinfection as are practicable shall be carried out. Even in the case of open moorland some security can be obtained by the disinfection of the folds and rubbing places to which sheep resort, and the collection and destruction of the tufts of wool both from such places and from the hedges and fences to which diseased sheep have had access must have the effect of removing infective matter. It also seems desirable that such preliminary steps to secure disinfection as are possible should be undertaken at once and repeated during the continuance of the outbreak, in order to minimise the risk of the spread of disease to other animals in the flock by mediate contagion from wool or other infective material, leaving the final and more thorough process to be completed when the disease has been eradicated on the particular premises. Article 3 (3) of the Order provides that when the existence of Sheep Scab on any premises has been confirmed the restrictions on the movement of the sheep on the premises shall continue in force until the Local Authority are satisfied by a veterinary enquiry that all the sheep on the premises have been cured, and have, since the enquiry, been thoroughly dipped. Further, it is provided that the premises to which the Notice (Form A.) applied shall not again be opened for the reception of sheep until the final disinfection of the place of detention shall have been completed. The Board desire, therefore, that the attention of Officers of the Local Authority should be specially drawn to the importance of taking every care that the processes of disinfection shall be as prompt and thorough as circumstances admit.

9. In pursuance of the recommendation contained in paragraph 34 of the Departmental Committee's Report the Board have incorporated in the Order a Schedule* in which is set out the composition of certain preparations which have been proved by experiment to be suitable for use as sheep dips without detriment to the fleeces of the animals dipped, and, if properly employed, to be effective cures for Sheep Scab The Order provides that any one of these preparations shall constitute an efficient sheep dip within the meaning of the Order, and an Inspector will be justified in certifying that, where one of these preparations is used, the prescribed dipping has been thoroughly performed if each sheep has undergone a period of immersion of not less than half a minute. Although the Board have not included in the above-mentioned schedule any preparation containing arsenic it is not to be assumed from this omission that the Board do not concur in the view expressed in the Report of the Committee (page 12) that "the arsenic dips are thoroughly effective in curing Scab." The possible danger to human beings attendant upon the preparation of such dips renders it advisable, however, that they should be compounded by qualified persons only. The Board at the same time recognise that there are a large number of sheep dips on sale which may be regarded as equally efficient cures for Sheep Scab, and they are making arrangements for the examination of any dips for Sheep Scab

* The Schedule is as follows :—

Prescriptions for Sheep-Dips approved by the Board for Sheep Scab.
(Quantities for 100 gallons of bath.)

1. LIME AND SULPHUR.

Mix 25 lb. of flowers of sulphur with $12\frac{1}{2}$ lb. of good quick-lime. Triturate the mixture with water until a smooth cream without lumps is obtained. Transfer this to a boiler capable of boiling 20 gallons, bring the volume of the cream to 20 gallons by the addition of water, boil and stir during half an hour. The liquid should now be of a dark red colour; if yellowish, continue the boiling until the dark red colour is obtained, keeping the volume at 20 gallons. After the liquid has cooled, decant it from any small quantity of insoluble residue, and make up the volume to 100 gallons with water.

2. CARBOLIC ACID AND SOFT SOAP.

Dissolve 5 lb. of good soft soap, with gentle warming, in 3 quarts of liquid carbolic acid (containing not less than 97 per cent. of real tar acid). Mix the liquid with enough water to make 100 gallons.

3. TOBACCO AND SULPHUR.

Steep 35 lb. of finely-ground tobacco (offal tobacco) in 21 gallons of water for four days. Strain off the liquid, and remove the last portions of the extract by pressing the residual tobacco. Mix the whole extract, and to it add 10 lb. of flowers of sulphur. Stir the mixture well to secure an even admixture, and make up the total bulk to 100 gallons with water.

NOTE.—The period of immersion in these dips should not be less than half a minute.

which the manufacturers may submit to them for approval. On being satisfied that a preparation may be relied upon as a cure for Sheep Scab, the Board will issue their formal approval to the manufacturer with an intimation that he is at liberty to label the preparation to that effect when offering it for sale. An Inspector will be justified in regarding as an approved sheep dip any preparation which bears a label indicating that it is prepared in accordance with the requirements of the Board, or that it has been approved by them. Where preparations other than those appearing in the Second Schedule of the Order are made use of, the instructions issued by the manufacturers as to the amount of dilution and as to the period of immersion should be carefully observed.

10. It is clear that the careful supervision of disinfection, and the service of Notices of Isolation will impose upon Officers of the Local Authority additional duties, for the proper performance of which adequate provision will have to be made. The supervision of the dipping of animals detained under Notices of Detention or of Isolation as well as of the general dipping described in the Sheep Scab (Compulsory Dipping Areas) Order of 1905 (see paragraphs 12 to 15 of this circular), will also fall to be performed by Inspectors of the Local Authority. Where for any reasons the whole of these duties cannot be undertaken by the existing staff, it will be necessary, if administrative action is to be effective, for the Local Authority to provide additional assistance. In one district of Wales this difficulty has been met by the appointment, by two adjoining Local Authorities, of a special Officer with practical experience amongst sheep, who has rendered valuable assistance to the Officers of the Local Authorities by whom he is employed, not only in detecting the existence of Sheep Scab on premises from which no report of disease had reached the Local Authority, but in arranging for, and supervising, the dipping of sheep. It will be for each Local Authority to consider whether some similar action on their part might not be found to be advantageous.

11. It will be observed that the provisions of the Sheep Scab (Regulation of Movement) Order of 1905 (see paragraphs 16 to 20 of this circular) have necessitated the readjustment of the powers of the Local Authority as regards the movement of

sheep into their district. In connection with Regulations made under the Sheep Scab Order of 1898, all of which are revoked by Order No. 6879, the Board have received repeated representations that requirements whereby the supervision of the dipping of sheep to be moved was imposed upon Officers of the Local Authority from which the sheep were to be moved, have had the effect in some districts of detaching such Officers from their more legitimate business of dealing with disease in their own district. Further, since the owners of the sheep to be moved have but little direct interest in securing the efficient performance of the operation in question, the dipping thus prescribed has, there is good reason to believe, been carried out in some cases in an almost perfunctory manner. For this reason and in view of the policy which underlies the Sheep Scab (Regulation of Movement) Order the Articles dealing with the making of Regulations by Local Authorities have been so framed as to limit the power of the receiving Local Authority as regards dipping of sheep brought into their district, to the treatment and subsequent movement of such animals *after* their arrival in their district. At the same time, however, Local Authorities will, by the operation of the three new Orders, obtain additional security against the movement of sheep into their district which have been exposed to the risk of infection either by reason of association with sheep on infected premises or from being kept in districts in which disease is known to be prevalent.

SHEEP SCAB (COMPULSORY DIPPING AREAS) ORDER OF 1905 (NO. 6880).

12. This Order is framed with a view to the adoption of special precautions in localities where Sheep Scab is known or suspected to be prevalent, and aims at regulating the movement of sheep out of areas to which its provisions may be applied by subsequent Order of the Board, and at securing that at suitable periods all sheep within such areas shall be effectually dipped irrespective of the presence or otherwise of disease on any particular holding. It is intended that the limits of such an area shall be prescribed only after careful investigation in the particular locality, in connection with which enquiries

will be made by an Inspector of the Board as to the most suitable period of the year for the enforcement of the provision as to compulsory dipping, regard being had to the character of the sheep farming in the locality affected.

13. In order that the Local Authority may be made acquainted with the number of sheep to be dealt with by them, provision is made for returns by flockmasters of the number and description of the sheep on each holding. Similar returns are to be furnished in respect of any sheep brought into the dipping area during the operation of the Order. The movement of sheep *out* of the area is limited (*a*) to sheep, if accompanied by the necessary licence, which have been thoroughly dipped with an efficient dip in the presence of an Inspector of the Local Authority, and which since they have been dipped have been kept from contact with other sheep which have not been so dipped ; (*b*) to sheep which have been specially examined by a veterinary surgeon, and since isolated ; and (*c*) to sheep which have been marked in the prescribed manner, and which are to be removed direct to a slaughter-house. Prior to the conclusion of the prescribed dipping period, the exposure of sheep at a market or sale within such area is restricted to sheep that have been recently and effectually dipped.

14. Every such Order will prescribe a period in each year during which general dipping is to be carried out within the area under the directions of the Local Authority or Local Authorities concerned. The period so prescribed will be of short duration, in order that arrangements may be made whereby all sheep which have not been dipped, shall, so far as is practicable, be kept from coming in contact with the sheep that have already been dipped. The time, place, and manner of dipping will be prescribed by the Local Authority. It will, therefore, be within the power of the Local Authority to regulate the dipping within a particular area in such a manner as will secure its most effective performance, and with due regard to the character of the sheep farming carried on therein and to other local circumstances.

15. It is thought that restrictions of this character will be specially applicable to unfenced mountainous districts, where the sheep of many owners graze on a common pasturage. It is

precisely in such circumstances that the eradication of Sheep Scab is most difficult, and that the intervention of the Central Authority appears to be required.

SHEEP SCAB (REGULATION OF MOVEMENT) ORDER OF 1905 (NO. 6881).

16. This Order provides for the general regulation of the movement of sheep *out of* any district to which its provisions may be applied by subsequent Order of the Board, and the intention is to apply its provisions to those groups of Counties or parts thereof in which Sheep Scab has for long been known to be prevalent, or as to which experience has shown that precautionary measures are necessary in the interests of other districts. It has been represented to the Board that where such general restrictions, *e.g.*, on the movement of sheep from Scotland to England, are admittedly desirable, the hardships inseparable from any interference with private business would be minimised if the necessary restrictions were imposed by the Central Authority and made generally applicable to all such movement.

17. In framing this Order the Board have adopted the view that as a general rule precautionary dipping is carried out in a more satisfactory manner where the necessary supervision is undertaken by the receiving Local Authority, whose interest in the matter is obviously greater than that of the transmitting Local Authority. The Order, therefore, provides that where sheep are to be moved direct to private premises outside the scheduled district, it shall be a condition of the licence that they be detained and isolated on such premises for a period of fifty-six days *or* until they have been effectually dipped in the presence and to the satisfaction of an Inspector of the Local Authority in whose district the premises are situated. Provision is, however, made whereby a Local Authority of a district, not included in the scheduled district, may license special sales to which sheep may be moved from a scheduled district if accompanied by a movement licence issued on a declaration that the sheep have previously been dipped, but sheep can only be moved from such authorised market with a further licence and subject to the above requirement as to detention and isolation until dipped.

18. Where it is intended that the sheep to be moved shall be taken direct to a market or sale not specially authorised in the manner above described, or to an exhibition outside the scheduled district, there appears to the Board to be no alternative but to require effectual dipping in the presence of an Inspector of the Local Authority as a condition precedent to the issue of the necessary licence in the case both of fat and of store sheep. To meet exceptional cases, however, an alternative of veterinary inspection at the expense of the owner is provided.

19. Where such place of destination is a slaughter-house no licence is necessary, but the sheep to be moved must be marked in the prescribed manner, and on arrival detained until they are slaughtered.

20. Sheep moved under the provisions of this Order are not subject to the Regulations of any Local Authority under the Sheep Scab Order above referred to.

21. Whilst the Board fully concur in the views expressed in the Report of the Departmental Committee as to the advantages of dipping in connection with the business of sheep-keeping, and would desire to see the practice extended to the point where it became universal, they have not been able to adopt the recommendations of the Committee so far as these relate to the *universal compulsory dipping* of the whole of the sheep in Great Britain under an Order to be made by the Board and to be enforced by the various Local Authorities.

22. As a remedy for Sheep Scab, general dipping can be regarded as efficient only where steps can be taken to secure the separation of the undipped sheep from those which have already been dipped. Restrictions on movement are therefore necessary, extending over the whole of the dipping period, and in proportion as the area over which the operation is attempted is extended, so must the dipping period, owing to climatic and other considerations, be prolonged. The interval allowed for the dipping of the whole of the sheep throughout the length and breadth of Great Britain, over 25,000,000 in number, would of necessity be very considerable, and, even if efficient supervision could be provided to carry out this undertaking, the consequent interruption of trade would hardly, in the view of the Board, justify the adoption of such a remedy. More detailed con-

sideration of the problem by those upon whom would rest the duty of carrying the operation into effect will, it is thought, lead to the conviction that any such attempt would not be likely to be attended with success.

23. On the other hand the Board would not withhold from an individual Local Authority the powers necessary to carry compulsory general dipping into effect within their district, provided that after full consideration it is decided that the operation might be properly undertaken. Any Resolution to that effect adopted by an Executive Committee should, however, be supported by a similar Resolution of the County Council as a whole, and the Board in that event would require that detailed proposals as to the methods proposed to be adopted should be laid before them. So soon as the scheme had been provisionally approved the Board would deem it necessary that the draft Regulations should be published in the locality for a sufficient period, so as to allow of objections being stated by the persons interested before the final approval of the Board was given. Publicity of this character would be calculated to secure that the public opinion of the district was favourable to the experiment, and without such support success is not likely to be attained.

24. In initiating measures to secure the eradication of this troublesome disease at a moment when the decrease in the number of outbreaks reported gives rise to the hope that a united effort may be attended with speedy success, the Board trust that they may rely upon the goodwill and support not only of Local Authorities, but of flockmasters and others connected with the sheep trade generally. Any steps of this nature must be attended with temporary inconvenience, and success is not to be hoped for without considerable immediate expenditure in matters connected with administration. If, however, the belief is well founded that the action now proposed will secure the eradication of Sheep Scab, the end attained should amply recompense those concerned, and the attainment of that end will the more speedily be secured by the hearty co-operation of all concerned.

I am, Sir, Your obedient Servant,

T. H. ELLIOTT, Secretary.

SOIL INOCULATION.

An account of the recent experiments in soil inoculation in Germany was given in a previous number of this *Journal* (September, 1904, p. 348), and it was stated that the new inoculating material prepared at the Agricultural Institute at Munich could be purchased from Professor Hiltner. Dr. Hiltner has now informed the Board that the charge for the supply of pure cultures to persons in the United Kingdom will be two shillings per tube, containing a quantity sufficient to treat the seed required for about three-fifths of an acre in the case of small seeds, such as clover, or in the case of large seeds (peas, lupins, and beans), about half that area. English farmers, therefore, who may wish to obtain a supply of this material should apply direct to Professor Hiltner, 9 F, Osterwaldstrasse, Munich, Bavaria, stating exactly (1) for what crop the material is required, as the bacteria for each crop are cultivated separately, (2) the area which it is proposed to inoculate, and (3) the date when the culture is intended to be used so that it may reach the applicant as fresh as possible. The application should be made at least a fortnight in advance of this date. The principal crops for which cultures are available are peas (*Pisum sativum*), horse-beans (*Vicia faba*), red clover (*Trifolium pratense*), crimson clover (*T. incarnatum*), lucerne (*Medicago sativa*), and vetches (*Vicia sativa*).

The instructions which are issued with the cultures state that a satisfactory result from the inoculation may be chiefly anticipated on those soils which are almost or entirely devoid of nodule-bacteria, such as newly broken up soil, or newly cultivated moorland, or on soils which contain the bacteria but not in a form suitable for the particular crop which it is proposed to cultivate. Inoculation, however, may be advantageous in other soils, as numerous experiments have shown that it is capable of increasing the number, size, and productivity of the nodules on the roots of leguminous plants.

The cultures are sent out in glass tubes, which should be preserved till use in a dark and not too warm room. The contents of the tube should be turned out with a clean piece

of stick either into water, or, better still, into quite fresh milk, care being taken to see that the glass is thoroughly rinsed out with water. The material must be disintegrated in the liquid (about half a pint) with the hands or with a stick, the "agar" (gelatine) being thoroughly crushed with the fingers.

Each tube is accompanied by a nutrient substance in the form of powder consisting of a mixture of pepton and grape sugar, which must be dissolved in the water or milk about half an hour before the bacilli are introduced.

After the bacilli have been well distributed in the nutrient solution the liquid should be poured over the seeds, which should be placed in a vessel of suitable size. In the case of larger quantities the seeds can be heaped up on a well-cleansed floor. They should then be thoroughly mixed with the hands or with a shovel, so that each single seed is moistened with the liquid. Should the seeds stick together after being so treated, a little sand or dry earth should be added. The sowing must, whenever possible, take place immediately after the inoculation. When sown broadcast the seed should at once be harrowed in, otherwise the bacilli may be dried up or killed by action of sunlight. For this reason it is strongly recommended that the sowing, when practicable, should be done on a cloudy day, and, in any case, towards evening. Rainy weather is specially favourable for good results.

To increase the chances of success a direct inoculation of the soil, as well as the inoculation of the seed, can be undertaken. The material should be prepared in the same way, and mixed either with earth from the field it is proposed to treat, or with compost, and this should be scattered over the ground and at once harrowed in before the seed is sown. About 5 cwt. of earth should be used to an acre. One tube is enough to inoculate 1 to 2 cwt. of earth.

In order to test the efficiency of the inoculation it is necessary to leave a corresponding plot of land untreated for comparison. This should be separated from the inoculated soil by a strip of at least a yard broad. To prevent any of the bacilli being carried over to the untreated surface, these plots should be sown and harrowed first of all. Implements, drills, &c., that have been employed on the inoculated surface must

under no circumstances be used on the plot that has not been so treated ; and to prevent the bacilli being conveyed from one plot to another no one must be allowed to walk across the plots. Care should be taken that the soil does not suffer from want of phosphoric acid or potash. Nitrogenous manuring is generally unnecessary, and in no case should nitrate of soda or sulphate of ammonia be used.

A supply of this material is being obtained from Germany by the Board, and it will be tested at the various Agricultural Colleges and Experimental Farms.

Investigations in the same direction as those of Dr. Hiltner have been made for several years past by Dr. George T. Moore, of the United States Department of Agriculture, with similar results. Extensive practical tests were made in 1904, and it is stated in the Report of the United States Secretary of Agriculture that the results show conclusively that where the organisms are used in accordance with the directions, increased yields, ranging from 15 to 35 per cent., are secured. Many farmers have been successful in getting stands of clover and other crops on soils where they had previously failed. The material for inoculating an acre of soil costs the Department of Agriculture about one cent ($\frac{1}{2}$d.).

Application was made by the Board to the United States Department for a supply of this material, and the Secretary of the Department, the Hon. James Wilson, has been good enough to place at their disposal a supply of cultures, which have been distributed to the Agricultural Colleges in this country in order that they may be tested both in the field and in the laboratory ; and in the latter case both with sterilised and ordinary soil. Owing to the demand by farmers in the United States, the Department is unable to supply the material to applicants in foreign countries. A bulletin on the results of many of the field tests which have been made in America is now being prepared by the United States Department and will be summarised in this *Journal*. The commercial production of this inoculating material is also being undertaken by several firms in the United States.

The cultures supplied by the United States Department differ from those of the German Institute in that the bacteria are supplied in a dry form. The following statement, which is

issued with the inoculating material, may be of interest:—"The enclosed package contains a dried culture of bacteria. This, when treated according to the accompanying directions, is capable of indefinite multiplication, and, if associated with the proper plants, of rendering available to these plants the free nitrogen of the air. This is accomplished through the formation of root nodules. The bacteria are beneficial only in connection with legumes ('pod-forming' plants), and are not applicable to other farm or garden crops. Each culture is adapted to a particular legume crop, the name of which is stamped upon the label. Even with legumes, these bacteria are of no decided benefit except when the proper nodule-forming organisms are lacking in the soil, but a crop of legumes with nodule-forming bacteria improves the soil for succeeding crops."

It is interesting to compare the directions for using this inoculating material with the instructions issued with the German cultures. They run as follows:—"Put one gallon of clean water (preferably rain water) in a clean tub or bucket, and add No. 1 of the enclosed package of salts. Stir occasionally until all is dissolved. Carefully open package No. 2 and drop the enclosed cotton into the solution. Cover the tub with a paper to protect from dust, and set aside in a warm place for twenty-four hours. Do not heat the solution, or you will kill the bacteria—it should never be warmer than blood heat. After twenty-four hours add the contents of package No. 3. Within twenty hours more the solution will have a cloudy appearance and is ready for use. To inoculate seed, take just enough of the solution to thoroughly moisten the seed. Stir thoroughly, so that all the seeds are touched by the solution. Spread out the seeds in a shady place until they are perfectly dry, and plant at the usual time, just as you would untreated seed. The dry cultures as sent from the laboratory will keep for several months. Do not prepare the liquid culture more than two or three days previous to the time when the seeds are to be treated, as the solution once made up must usually be used at the end of forty-eight hours." If preferred, the soil may be inoculated in a similar way.

The following directions issued by the United States Department for preparing large amounts of inoculating material indicate

the substances which are to be used for making up the solution in which the bacteria are to be distributed :—"To prepare the culture solution, first select the tub or bucket in which you wish to grow the bacteria. Scald it out thoroughly. Then put in as many gallons of water as you wish to prepare of the culture liquid. Rain water that has been thoroughly boiled and allowed to cool is the best for this purpose. Add to each 10 gallons of water 12 oz. of either brown or granulated sugar, $1\frac{1}{2}$ oz. of potassium phosphate (monobasic), which can be obtained at any drug store and $\frac{1}{16}$ oz. (30 grains) of magnesium sulphate. Stir until dissolved, then carefully open the small package marked No. 2 and drop the enclosed cotton into the solution. Do not handle any more than is absolutely necessary. Cover the tub with a moist cloth to protect from dust, mould spores, &c. Keep in a warm place, but never let the temperature rise above blood-heat. After twenty-four hours add 6 oz. of ammonium phosphate and allow the mixture to stand for another twenty-four hours. The liquid will now be cloudy and is ready for use. To inoculate the seed use just enough culture liquid to moisten the seed—about three-fourths of a gallon per bushel. This inoculating may be done either in a tub or trough, or by pouring the culture liquid on to the seed on a clean floor, and stirring and turning the heaps of seed with shovels until all are thoroughly moistened. After inoculation the seed should be spread out in a clean place until sufficiently dry to handle. If planting is not to be done at once the seed must be thoroughly dried to prevent moulding."

Sprouting Seed Potatoes.

The success which attended the experiments of the Irish Department of Agriculture in sprouting potatoes for early markets led the Department to consider whether the same method might not be advantageously applied to late or main-crop varieties. In 1903 trials between sprouted and unsprouted "seed" were carried out by the Agricultural Instructors for Antrim, Cavan, and North Tipperary. The varieties tested were Champion, Flounder, Bruce, Up-to-Date, Black Skerry, and Abundance. The soils varied in character from peaty to poor clay, but the

cultivation, manuring, and general treatment on each farm were the same for sprouted and unsprouted seed. In 1904 similar experiments were carried out in 34 centres.

The increase due to sprouting varied in 1903 from 10 cwt. to $3\frac{1}{2}$ tons, and in 1904 from 13 cwt. to over 6 tons. The increased yield in the latter year averaged 2 tons 13 cwt. per acre, representing over 25 per cent. on the average crop from unsprouted seed, and in only two cases was there a decrease.

The chief advantage of sprouting is that a few weeks' growth secured in the boxes before the seed is planted. Consequently if the two kinds of seed are planted about the same time, the crop from the sprouted seed is ready for lifting several weeks before that from the unsprouted seed. Again, if a farmer has seed sprouted and the soil is wet and cold, or the conditions unfavourable, he may delay planting for a time. Further, on freshly tilled land the sprouted potatoes make such an extremely rapid growth as to smother the weeds for the whole season.

Another advantage gained by sprouting seed is that the first bud is preserved, and the plant is therefore more vigorous throughout the season; whereas with unboxed seed the first bud when it exists is tender and usually gets broken off.

The size of the box recommended for general use is: length, 24 in.; width, 12 in.; depth, 3 in. The corner pieces are 7 in. in height, and sufficiently strong for the boxes to rest one on the top of the other when piled for winter storage.

The handle-bar is made very strong and tenoned into the end pieces, the whole forming a light, handy, durable utensil which, with ordinary care, will last for years. The boxes are not expensive, the cost varying from 30s. to 35s. per 100, according to the quality of the timber and the number of boxes bought at one time. Each box holds about 20 lb. of potatoes or six boxes hold about 1 cwt.

The seed potatoes are filled into the boxes until level with the sides. No earth is mixed with them and no water added; nor need particular care be taken to have the eyes set upwards. The potatoes are simply poured indiscriminately into the boxes, and left to sprout. If large sets are used they will be one deep in the boxes, but smaller ones may be two or three deep. This does not matter as the sprouts find their way up through the

interspaces. When the boxes are filled, they are piled up one on the other to any height that may be found convenient.

There is no way in which seed can be kept more safely or stored in smaller compass. Moreover it can be examined and overhauled at convenience, should that be found necessary. The sprouts should be about 2 in. long. If much longer they are apt to get broken off unless very tenderly handled. The length of the sprouts, however, cannot always be regulated, and sometimes they may be so long as to touch the box above. There is no actual harm in this, but it is inconvenient and should be prevented if possible. The best way to check growth is to expose the boxes to light and air. When growth is desired exclude all light. Exposure to light and air for some time before planting is necessary in any case, in order to toughen the sprout and enable it to be handled. When the boxes are taken into the light the sprouts are very white and tender, just as they are in a pit, but after a few days' exposure they become quite tough and do not readily break.

At this stage another most valuable use of the box becomes apparent, viz., the facility it gives for checking the purity of the stock. Among the multiplicity of varieties there are scarcely two which have the same colour of stem or habit of growth. Thus Puritan has a white and spindly stem which becomes greenish on exposure; Early Regent has a short, sturdy stem which becomes bright red; Maincrop becomes purple. In this way it is always possible to eliminate the "rogues" before planting, although it is a troublesome operation.

Irish farmers, as a rule, prefer to cut their seed potatoes. This method has some advantages, the chief being the saving of seed effected. The practice is, however, carried to extremes, for three or four sets are often cut from a small tuber. This certainly saves seed, but it greatly reduces the yield.

Boxing almost precludes cutting. Of course the seed can be cut after exposure has rendered the sprout strong enough to be handled. This, however, is a tedious and expensive process, and is not recommended.

If, however, cutting is desired, the seed should be boxed

early, and when a tiny shoot has been sent out it should be broken off. The potatoes will then bud from several eyes; but it is not advisable to cut into more than two pieces. Tubers should not be cut until immediately before planting and the cut surfaces should always be dusted over with air-slaked lime.

Potatoes for boxing should be dressed over a $1\frac{1}{2}$ in. riddle.

The best results may be expected when medium-sized, well-sprouted and uncut seed are planted about 14 in. apart in the drills.

After the boxes have been filled and housed care must be taken lest the potatoes suffer damage from frost. It takes a good deal of frost to injure potatoes in boxes provided there are no apertures through which cold winds can reach them; but in case of a protracted and very hard frost it may be necessary to cover them carefully, or in very severe cases to burn one or more lamps in the boxing house.

House accommodation is not always easily provided. Boxes are frequently piled in the rafters of stables and cowsheds, and they do quite well in such places.

Rotting of Potatoes.

Heavy losses are often sustained by farmers owing to potatoes going rotten when stored through the winter in "pies" or pits. This rotting is due to the action of the fungi of potato disease (*Phytophthora infestans*) and of Winter Rot (*Nectria solani*). In the case of the former spores of the fungus that fall to the ground are washed by rain through the soil and infect young potatoes, especially those growing near the surface. The mycelium of the fungus also passes down diseased stems into the young potatoes. If the season is wet and warm, the mycelium present in the potato continues to grow, soon causing brown spots to appear, and ending in the rotting of the tuber. On the other hand, if potatoes that are infected are kept dry, the mycelium in their substance remains stationary until the following spring, when it commences growth and passes along the "sprouts," finally appearing in the fruiting condition on the leaves.

The fungus of Winter Rot is undoubtedly very common among potatoes which have rotted in the pit. In the early stages it produces softening and swelling in tubers, which are later attacked by bacteria and show "wet rot." Experiments in the prevention of these two diseases were conducted at the Garforth Farm belonging to the Agricultural Department of Leeds University in 1903–4, the effects of dusting with quick-lime and slaked lime at the rate of 7 lb. per cwt. being tested on $1\frac{3}{4}$ cwt. of sound potatoes mixed with 28 lb. of infected potatoes stored in pits for twenty weeks.

Of the two kinds of lime used there is no doubt that lime in the "quick" condition is preferable. Potatoes dressed with "slaked" lime in all cases turned out sticky, the lime adhering to them as a pasty mass, and, on drying, the lime became so firmly attached that it was not removable in the ordinary processes to which potatoes are subjected in preparing them for market. When quicklime was used, the condition of the potatoes was quite different. A dry shelly case had been formed by the lime around each tuber which readily became detached from the skin, leaving it clean and bright.

It would seem from the results obtained in these experiments that in "pieing," either for seed purposes or for consumption in spring, lime may be profitably used to prevent loss. Tubers affected with brown discolourations go very readily to "wet rot," and "wet rot" itself is communicable to sound and healthy tubers. Lime in either of the forms used, while it does not prevent the brown tubers from going rotten, yet prevents infection of surrounding tubers and the spread of "wet rot," which is the worst enemy that threatens the "pies" in winter.

It is rather remarkable that there should be any difference in the condition of the potatoes treated with quick and with slaked lime. It is well known that quicklime in contact with air containing moisture rapidly becomes hydrated or slaked, and the ultimate product is the same in each case, whether quick or slaked lime is used, and the potatoes might be expected to turn out equally dry from all those "pies" where lime was used.

The explanation offered in the Report is that in the cases where quicklime was used the moisture necessary for slaking was obtained in the "pie" from the skin of the tubers with

which the lime was in contact and from the air. The result of hydration is expansion, and thus a thin, but compact, shell would be formed around each tuber, but not closely attached to its surface. On drying, such a shell would easily scale off, leaving a clean surface.

Lime in both forms seems to have promoted the sprouting of the tubers in the spring. In the case of those treated with quicklime the sprouts were fully a fortnight earlier than those of the untreated "pies," while an advantage of three weeks was apparently gained with "slaked" lime.

This disease is met with, under such local names as Big Joint, Joint Evil, Schooley, in most parts of the British Isles.

Navel Ill or Specific Arthritis of Lambs.

Symptoms.—The lambs are noticed a few days after birth to be moving stiffly and to be disinclined to walk or suck. They lie down continually, and with difficulty are got on to their legs. Their joints begin to swell, and often it is apparent that abscesses have formed on them—the hock, stifle, point of the shoulder and knee being the joints usually affected. In the worst cases abscesses form in different parts of the body (particularly the kidney and liver), and kill the lamb by exhaustion or by the poisons elaborated by the germs of this disease.

Cause.—This disease is caused by the entrance into the system of the newly-born lamb, through its unclosed navel, of germs whose special function is the formation of pus or matter. These germs are widely distributed in nature, but are found in greater numbers and probably in a more virulent form on those spots frequently soiled by animals, such as farm-yards, lambing yards, &c., than in the fields. For this reason a permanent lambing shed or a site for a temporary yard used continually is a more dangerous place than the pastures.

Prevention.—Every outbreak on a farm increases enormously the number of these germs, and so increases the probability of future attacks. On the other hand, if outbreaks are prevented,

the germs become fewer in number, and may ultimately be reduced to a negligible quantity.

A site for lambing the ewes must be chosen as free from infective material as possible, and there is no doubt that ewes lambing in the fields rear a greater number of lambs than in temporary or permanent lambing yards. Shelter, if necessary can be provided by strawed hurdles dotted about the fields in the form of a cross, or arranged to break the prevailing winds. These hurdles should be frequently re-strawed and moved to fresh spots during the lambing season.

The system in vogue in some counties of passing the whole flock of ewes, if a big one, through one lambing yard cannot be too severely condemned. A large flock should be split into as many divisions as convenience will allow ; it is then possible to confine disease to the divisions in which it occurs. If the lambing yard system is adopted it is imperative that a fresh site should be chosen each year.

All dead lambs and the membranes in which they are born should be buried promptly. Straw on hurdles and for bedding should be renewed occasionally and hurdles should be lime-washed. Manure and straw from hurdles should be placed in a heap, fenced off from the ewes, and should never go on to sheep pastures. At the end of the season the site of the yard should be spread with lime and the hurdles lime-washed.

In addition to these preventive measures, care should be taken that the shepherd does not carry disease from ewe to lamb or from lamb to lamb. A shepherd's hands must be continually and scrupulously cleansed ; washing with soap and water is not enough, they must also be disinfected. Nails should be kept short and scrubbed with a nail brush. His clothes should be covered with a lambing coat which can be washed. Dead ewes or lambs should not be skinned by the shepherd. A little disinfectant should be applied to the navel of each lamb immediately after birth. Stockholm tar has been found useful for this purpose. A ewe which has given birth to a dead lamb should not be allowed to run with the healthy ewes and lambs.

Treatment.—If an outbreak should occur the attacked lambs, with their mothers, should be isolated on a spot not likely to be

used for sheep for some time. If only a few lambs are attacked it will be found cheaper to kill them and dry off the ewes, as only a few attacked lambs grow into sheep which show a profit. If a large number are attacked, as many as possible must be saved, and it is then worth while getting a man to nurse them who does not go near the healthy flock. Bottle feeding will be necessary for the worst cases, and care must be taken that a lamb does not lie always on one side, as the limbs of that side are likely to waste or become paralysed. If a ewe loses her lamb it is not safe in this disease to "split a double" and mother one on to her, as this lamb often becomes attacked, and the expedient must not be resorted to of putting the skin of a ewe's dead lamb on to a lamb to be adopted by her.

Ewes which have lost their lambs should be carefully watched, as it may be found that germs from the lamb may have got up her teats and produced inflammation of the udder, which, if it does not kill the ewe, will probably prevent the gland secreting milk in the future, and so render her unfit to breed again.

The site of the lambing yard in which the diseased lambs got infected should be immediately changed, hurdles re-strawed and disinfected. If a field is thought to be responsible, then move the sheep on to fresh ground. In this way it is possible to avert a serious outbreak.

Live Stock Import Regulations ;— Cape Colony.*

The following are the regulations for the importation of live stock by sea into Cape Colony. Under Proclamation No. 173 of 1900 no horses, mules, or asses will be allowed to enter the Colony by sea until they have been examined by an officer authorised by the Government and certified by him to be free from glanders or any other infectious or contagious disease. Should the examining officer detect the presence of glanders in any animals on board, these animals

* Live stock import regulations have been published in this *Journal* for the United States, Vol. X., No. 1, June, 1903, and Vol. XI., No. 7, October, 1904, and for Argentina, Vol XI. No. 10 January, 1905.

will be at once destroyed and their carcases disposed of in the manner prescribed. The remainder of the shipment will be allowed to be landed only on condition that they are removed to a quarantine station approved of by the Government, and there subjected to the mallein test by a duly qualified officer, under the direction of a Government veterinary surgeon. In the event of the test indicating the existence of glanders, all animals so shown to be affected will be destroyed. All expenses are to be borne by the owner of the animals.

In the case of cattle, Proclamation No. 75 of 1900 provides that no cattle are to be allowed to enter the Colony by sea unless accompanied by a certificate, signed by a duly qualified veterinary surgeon of the country of origin, to the effect that the animals have before embarkation been submitted to the tuberculin test, and have not given any reaction indicative of the presence of tuberculosis. If on examination the Government officer shall have reason to believe that the animals are free from any contagious or infectious disease he shall give a permit for their landing at any port or place in the Colony. In the absence of a satisfactory certificate the cattle will be quarantined and subjected to the tuberculin test. In the event of the test indicating the existence of tuberculosis, the animals will be slaughtered. These regulations do not apply to cattle imported solely for purposes of slaughter.

Pigs intended for importation into the Cape must comply (Proclamation 214 of 1903) with the following conditions:—They must be accompanied by a certificate, signed by a duly qualified veterinary surgeon, stating that at the time of shipment the pigs were apparently free from the appearance of any contagious or infectious disease, and by a declaration on oath, signed by the consignor before a competent legal authority in the country of export, to the effect that the pigs have been on the premises from which they are removed, prior to being moved for shipment, for at least fourteen days, and that during such period no other pig has been introduced or received into such premises, that the pigs are not affected with swine-fever, that they are not moved out of a swine-fever infected place or area, and, further, that the movement is not prohibited by any provision of law then in force in the country from which such movement

takes place. In the event of such a certificate and declaration not being provided pigs may only be landed at Cape Town, Port Elizabeth, and East London, where they shall be quarantined for not less than twenty-eight days from the date of embarkation. Any pigs found to be infected with swine-fever on arriving at any port in the Colony, or which have been in contact during the voyage with the pigs so affected, will be dealt with in such manner as the Government may direct.

Weighing of Wet Grains.

Dairy farmers who buy wet grains in London for cow-feeding occasionally find that the weights of consignments received by them are materially less than the weight alleged to have been put on rail at the forwarding station. Some reduction is likely to occur owing to drainage, but the deficiency may be partly due to the fact that short weight has been loaded or that the grains have been loaded excessively wet. If it were the practice of railway companies to weigh every truckload of grains, farmers could check the weights of the consignments despatched by referring to the railway weights, but railway companies accept, as a rule, the declarations of the senders of goods as to their weight and only occasionally check the correctness of these statements.

In London wet grains are sold by the ton, and, apparently, the weights of consignments are more often estimated than ascertained by weighing. In Glasgow wet grains are sold by the boll of six bushels. The boll is sometimes measured by means of bushel baskets, but often estimated, and it is stated that fuller measure is given when the trade is slack than at other times. In the London trade any abnormal excess of moisture is against the purchaser, but in the Glasgow trade it is in his favour, as the grains when excessively wet lie closer in the measure.

It has been suggested to the Board by the President of the West of Scotland Dairy Farmers' Association that bulk is probably a fairer test of value in grains than weight, and is generally more easily ascertained or estimated by farmers than

weight; and that in purchasing grains it is desirable to measure the amount received from time to time and to ascertain by experiment which dealers give the best value of grains in proportion to cost, including price of grains and carriage.

The following note on the Dry Feeding of Chickens has been prepared by Mr. Edward Brown, of University College, Reading :—

Dry Feeding of Chickens.

One of the great difficulties which formerly attended the artificial rearing of chickens, more especially upon a large scale, was the excessive mortality among the young birds when from ten to twenty days old. In some cases the percentage of loss reached 50 to 60 per cent. of the chicks hatched. Naturally, winter chickens, or those brought out during cold, wet weather, suffered much more than those which were produced during the later spring months ; and it was found that the loss was most pronounced on damp soils, especially in valleys.

After careful experiments and observations during several seasons, the conclusion arrived at was that the primary cause was want of exercise, with consequent weakness of constitution and inability to withstand rapid changes of atmosphere or damp foggy mornings. When chickens are with a hen she encourages them to seek and scratch for food, and they are kept busily engaged all day, with the result that the organs and muscles of the body are strengthened. On the other hand, chickens reared artificially are frequently fed so abundantly that there is no incentive to search for food, while the food itself is generally such as to induce softness of tissue in the body and to force growth, the digestive organs being called upon to a very limited extent, and the birds having no inducement to take exercise are liable to be affected by wind or cold. So long as the food supplied was what is called "soft," that is consisting of meal mixed with water, it was impossible to secure an alteration in this respect, and this led to the introduction of the system of "dry feeding." Dry feed consists of grains and seeds given in their natural state. To compel the birds to obtain exercise these grains and seeds are scattered among

cut chaff, which is thrown down upon the floor of the breeder or brooder house, and they must scratch among the chaff to find them. In uncovering one seed the rest are buried. Experience has proved that chicks will without any teaching commence to scratch as soon as they need food, about thirty hours after hatching; in short, that the action is instinctive. The result has proved remarkable. Mortality has been reduced to a minimum, and the birds thrive much more rapidly and entail less labour for management than under the old system. They feed when they are hungry, not when it is thought they ought to be ready for a meal. But it is beneficial to give some soft food after they are a month old.

The following table of feeding has been adopted at the College Poultry Farm, Theale, with great success:—

A.—DRY FEED MIXTURE. (First Four Weeks.)

Wheat ...	... 3 parts (by weight)	Hempseed ...	... ½ part (by weight)
Dari ...	.. 2 ,, ,,	Linseed ...	... ½ ,, ,,
Canary seed	... 2 ,, ,,	Buckwheat ...	... 1 ,, ,,
Oatmeal ...	... 2 ,, ,,	Rice	... 1 ,, ,,
Millet ...	... 1 part ,,	Meat ...	... 1 ,, ,,
Broken maize	... 1 ,, ,,	Grit	... 1 ,, ,,

B.—DRY FEED MIXTURE. (After Four Weeks.)

Wheat ...	... 4 parts (by weight)	Hempseed ...	... 1 part (by weight)
Broken maize	... 2 ,, ,,	Meat ...	... 1 ,, ,,
Dari ...	... 2 ,, ,,	Linseed ...	... ¼ ,, ,,
Buckwheat	... 2 ,, ,,	Grit and oyster shell,	2¾ parts ,,
Rice ...	... 1 part ,,		

C.—SOFT FOOD. (After Eight Weeks.)

Barley meal	... 4 parts (by weight)	Meat ...	... 1 part (by weight)
Toppings ...	... 4 ,, ,,		

D.—BISCUIT MEAL.

Spratts' Patent Chicken Meal.

During the first four weeks Feed A is given alone in litter; in the next four weeks Feed D is given warm (mixed with warm water) at 7 a.m. and 2.30 p.m., and Feed B scattered in the litter at 10 a.m. and 5 p.m.; and during the next four weeks Feed C is given warm at 7 a.m., and Feed B scattered in the litter during the rest of the day.

Apple and Pear Scab.

Although the fungi (*Fusicladium dendriticum* and *F. pirinum*) causing scab on apples and pears respectively are different species, they are very closely allied, and as the general appearance of the disease and the methods of treatment are identical in both instances, a separate description of each is not necessary.

Scab is probably the most general and widely distributed o ungus diseases attacking apples and pears, and during certain seasons the entire crop is much depreciated in value, or rendered altogether unsaleable, owing to the presence of numerous blackish blotches or scabs and gaping cracks on the surface.

To the casual observer scab is only recognised on the fruit,

APPLE AND PEAR SCAB.

whereas in reality the fungus appears first on the leaves and young shoots, from whence the spores are washed by rain on to the fruit, which is the last to be attacked. If the fruit is nearly full-grown before it is infected, the spots formed by the fungus remain small and are irregularly scattered over the surface,

and although the market value is thereby depreciated, such fruit is not materially injured, the scabs being quite superficial.

If, however, infection occurs when the fruit is young, its further growth is checked; the surface becomes more or less covered with scabs of various sizes, and at a later stage is irregularly cracked.

On the leaves and young shoots the fungus forms minute velvety, dark coloured patches, which have an olive-green tint when the spores are ripe.

Spraying with half strength Bordeaux mixture (*i.e.*, 6 lb. of copper sulphate, 3 lb. of quicklime to 100 gallons of water) should be commenced on the first appearance of the fungus on the foliage; if spores are once allowed to mature the case is practically hopeless, owing to their enormous numbers and rapid dispersion. Spray at intervals as found necessary until the apples are about the size of a hazel-nut.

Strong Bordeaux mixture must not be used, otherwise the foliage will be scorched.

When the disease has been present in an orchard all apple and pear trees should be thoroughly drenched with a solution of sulphate of copper—1 lb. of the sulphate to 25 gallons of water. This should be applied during the winter, before the buds begin to swell, otherwise the foliage will be completely destroyed. This winter wash is of great value in destroying fungus spores present in crevices in the bark, and as a preventive should be regularly applied.

The fungus tides over the winter in fallen diseased fruit, consequently all such should be gathered and burned.

The Banded Pine Weevil.

The Banded Pine Weevil (*Pissodes notatus*) is one of a genus of weevils of which, in our country, three species are enemies of the forester, viz., *P. notatus*, *P. piniphilus*, and *P. pini*; complaints are most frequent of the first of these species.

P. notatus is injurious both as beetle and as larva. The beetle in feeding pierces the bark with its rostrum or snout right into the cambium and the innermost layers of the wood;

the larvæ or grubs tunnel between the wood and the bark, and the result of bad infestation is the death of the plant.

The following symptoms may be taken as indications of attack :—

(*a*) Little snout punctures, as if the bark had been pierced here and there by a needle.

(*b*) Bead-like drops of resin issuing from these places.

(*c*) Drooping of the plants, with a reddening of the needles.

(*d*) At a late stage of the larva's work in young or smooth-barked parts, little risings on the bark may be felt by the fingers, or little ridges may be seen ; these mark the position of larval tunnels or pupa beds.

Description of Insect.—The beetle is red-brown in colour, and measures up to ⅜ in. in length ; both upper and under surfaces

FIG. 1.—*Pissodes notatus.*
(The line on the right shows natural size.)

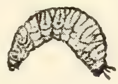


FIG. 2.—LARVA.
(Magnified).

are powdered with white scales. On the upper surface of the prothorax are four well-marked white points, and a fifth on the scutellum. The wing-covers have two transverse yellowish or whitish bands of scales, one in front and one behind their middle ; the front one is non-continuous at the meeting place of the wing-covers, whereas the hind one is continuous right across the wing-covers.

The larva is a fleshy, somewhat wrinkled, curled, legless grub, with a brown scaly head and strong gnawing jaws.

Life History.—The female after copulation lays her eggs in punctures made in the bark. From these hatch out grubs, which make galleries between the bark and the wood. If pines in tne pole stage be chosen then several eggs may be laid near one another, and the galleries, owing to the sufficiency of room at the disposal of the grubs, show a star-like pattern ; in young plants however, the larvæ tunnel downwards or upwards. A trail of

brown bore-dust marks the path of the grub. The grub on being fully fed gnaws into the outer wood layers at the end of its gallery, and in this hollowed-out bed, protected by a cover of sawdust and wood chips, the pupal stage is passed. The beds may be made all down the stem of the young pine, and also for an inch or two below ground. A very favourite place is immediately below the whorl of branches, where, in an infested plant, one is almost sure to find several beds clustered together. The yellowish-white coloured pupa gradually darkens into the beetle, and when the beetles are ready to issue they bore a circular hole through bed cover and bark.

The generation is typically an annual one. MacDougall has shown* that the *Pissodes* have a remarkably long life in the adult stage, and that those beetles which have bred in one year may, after hibernation, proceed anew to egg-laying. In his experiments two females lived in the imago or adult stage two years, and a male for three. Adult beetles may be met with from April (March in a favourable season) onwards to and including September, and egg-laying may take place at any time during this period.

Plants Attacked.--The favourite breeding places are young pines from three or four up to eight years of age, but trees in the pole stage are also infested. The favourite host plant is Scots pine (*Pinus sylvestris*), but in Britain *notatus* has also been found in Austrian pine (*P. austriaca*) and Weymouth pine (*P. strobus*). The beetle also breeds in pine cones. There are Continental records of attack on spruce and larch, but this is exceptional. Whilst amongst older trees the weak and sickly will be chosen for egg-laying, the thinner branches of sound trees and any part of the stem or branches of a young pine may be used.

Preventive and Remedial Measures.—1. Where the beetles have not yet got a footing a timely and vigorous rooting out of all suppressed or sickly pines will go far to prevent injurious attack.

2. Where the beetles occur in numbers, collecting them would be a useful measure; at any rate, the plan could be adopted in nurseries with good results.

* Proceedings of the Royal Society of Edinburgh, Volume XXIII.

3. The great means the forester has in proceeding against this pest once it has got to work is the preparation of catch-trees or decoy stems. These should be sickly plants or trees left here and there in nursery or plantation ; or plants can be artificially weakened and left standing, or an older tree can be cut down and allowed to lie as a place for breeding in. In consequence

FIG. 3.—YOUNG PINE KILLED BY P. NOTATUS. BARK REMOVED TO EXPOSE PUPAL BEDS WITH EXIT HOLES. (Two-thirds natural size.)

of the long-continued life and egg-laying, such trap plants must be arranged and visited and renewed at intervals through the year, from March till October. Each such trap might remain for two months, when young trap plants should be destroyed, or older ones barked and the exposed larvæ destroyed. Natural aids will be forthcoming from parasitic *Ichneumonidæ*.

The Large Brown Pine Weevil.

This insect, *Hylobius abietis*, one of the most grievous pests in forestry, is in our country the cause of the dying away of young coniferous plants, acres of which may have to be re-planted because of the weevil attack. The larvæ or grubs live in the stumps and roots of felled conifers, and therefore do little actual harm; the harm is done by the adult beetles, which gnaw the bark of the stem of young plants and the younger shoots of older plants.

Plants attacked.—The plants attacked by the adult are Scots pine, Weymouth pine, spruce, larch, Japanese larch, silver fir, and Douglas fir. It is characteristically a conifer pest, but if the coniferous crop be not pure but mixed with broad-leaved species such as oak, alder, birch, these latter may also be attacked.

Characteristics of attack.—(*a*) Pieces may be bitten away here and there all down the young plant. The damage may extend as far as the cambium layer. Very young plants may be more or less completely barked. (*b*) Drops of resin may be found exuding from the wounds. These drops dry into rough masses over the stem. (*c*) The dying off of attacked plants.

Description of Insect.—The beetle measures up to half an inch in length. It has a marked proboscis, with the kneed-antennæ springing from near its apex. The colour is dark brown, with yellowish or golden hairs or scales on various parts of the body, but these are specially marked on the wing covers, where they form bands; in old beetles, the scales may have been rubbed off.

The larvæ are yellowish-white in colour, legless, with brown heads and biting jaws; they have a curved form, and when full grown measure up to half an inch.

Life history.—The beetles choose as their favourite place for egg-laying the stumps and thicker roots (exposed or below the surface) of felled pine and spruce. The eggs are laid singly, and the grubs on hatching gnaw long tunnels between the wood and the bark, these tunnels increasing in width with the growth of the grub; behind the grub the tunnels are filled with frass from the boring. When full grown the grub gnaws out a bed in the youngest wood layers, and here, under a cover of sawdust

and wood chips, it may lie a long time (larvæ full grown in autumn may lie as unchanged larvæ till the next May or June) before passing into the pupal stage. The pupal stage in May

FIG. I.

ATTACKED STEM, showing drops of resin exuding from the wounds.

FIG. 2.

H. ABIETIS. (Magnified.)

Fig. 4.

LARVA OF H. ABIETIS.

FIG. 3.

YOUNG DOUGLAS FIR KILLED BY WEEVIL; WITH WEEVIL FEEDING. (Natural size).

or June lasts about three weeks, and the beetles issue by a round hole bored through bed cover and bark.

The adult beetles are long-lived, and Von Oppen has shown that they can live during a season, and after hibernating can proceed anew to pairing and egg-laying. Thus in the early summer different generations of beetles may be found at work, (1) some of the egg-laying beetles of the previous year, which, after their hibernation, continue their egg-laying; (2) beetles which had completed their development in the previous autumn but too late to proceed to reproduction; and (3) beetles newly adult, which having passed the winter as larvæ or pupæ had developed into the adult in the warmth of spring or summer.

The point of great practical importance is that there is no limited swarm period, but that beetles may be found at work feeding and reproducing during all the warm months of the year.

Preventive and Remedial Measures.—1. Removal from the felled area of stumps and roots, so as to deprive the beetles of breeding places.

2. The stumps and roots may be left to serve as places for egg-laying, but they must be grubbed up and burnt, so as to destroy the enclosed brood before development has reached the adult stage.

3. Avoid having breeding places and feeding places side by side or near one another, *i.e.*, avoid cutting and planting areas in regular sequence. The longer the time elapsing between felling close to a newly-planted area the better. Much can be said for the practice of allowing stumps and roots which are left in the ground to decay before planting the area.

4. The making of trenches, to keep the beetles from reaching a newly-felled area for egg-laying, or to isolate a clean area newly planted, is often recommended. The trench, a foot deep and 8 to 10 in. wide, should have steep sides and be clear of rubbish, and the beetles which fall into it must be collected every day and destroyed. Opinions differ as to the value of these trenches. Experience shows that they may easily fail as traps, as the beetles can fly over them.

5. Branches of pine and spruce a yard long and 2 to 3 in. in diameter thrust into the soil on felling areas are used by

the beetles as places for egg-laying. After some months these can be visited and barked so as to destroy the brood.

6. Experience shows that the most efficient means of trapping the beetles is to lay here and there on the ground in newly-cleared and infested areas pieces of fresh Scotch pine bark, 8 to 12 in. long by 4 to 6 in. wide. These should be laid on the surface (not below it), with their outermost surface upwards. The beetles

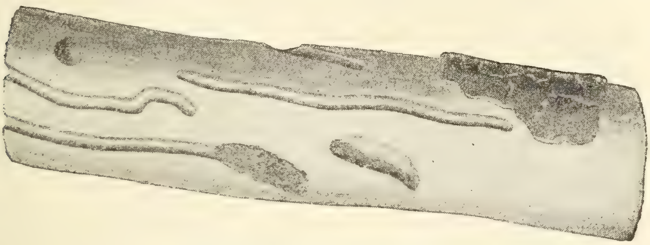


FIG. 5.—ROOT OF SPRUCE WITH BARK REMOVED, showing tunnels of grub, bed of pupa, and hole into wood made by full grown larva.

collect on the under surface for feeding. These traps must be regularly visited, and the beetles destroyed, either by dropping them into boiling water or into a vessel containing paraffin. The traps must also be often renewed, as when they dry and lose their odour they cease to attract. In Scotland, thousands of beetles have been caught by these means. It is of the utmost importance to proceed against *Hylobius* in its breeding places, and not wait till the beetles have started to feed on the young plants.

Injury to Trees by the Green Woodpecker.

The attention of the Board was recently called to the damage done to trees in certain parts of Gloucestershire by the green woodpecker. Large apparently sound oaks were attacked, and also pines, lime and old fruit trees, holes 3 in. or more in length being bored into the trunk. Specimens of these stems have been very carefully examined, and no galleries of insects leading to or away from the holes have been discovered. One of the stems, 10 ft. or so in length, although apparently sound, showed itself to be

rotten in the centre for a considerable distance. This decay, however, may have been secondary. There was nothing to have prevented this hole from having been a nesting or a sheltering place; and the cavity was made under a branch, *i.e.*, in a characteristic position for a nest.

It was noticeable in this and another log that small holes showing at the outside could be traced inwards for some distance, the lining of the tunnel being brown, soft, and discoloured. Following up these holes, in at least six cases pellets of shot were found embedded at the end.

Apart from the possibility of some of the holes being used as nests, some might have been dug out first in part, and other birds noticing the hacking had added to it, incited to the work by the appearance of a wound. To reduce the chances of temptation to destruction in this way, telegraph posts, &c., are commonly "stopped."

In the case of the smaller holes the damage was in nearly every case in perfectly sound stems. Such markings have been known for a long time. So far there is no definite and accepted explanation, but the following reasons may be suggested:—(1) mistaken instinct; insects were expected but were not there; (2) the sap was grateful to the bird; and (3) the holing was done in order to reach the cambium and youngest bast layers.

That woodpeckers attack sound trees is well known, and a specimen has been seen hacked all down the bark, which was literally in shreds. In this case there was no trace of insects, and it is probable that the bark after being first attacked was noticed by other woodpeckers; this attracted them, perhaps made them suspicious, and thus the damage was extended.

Badly hacked stems should be removed, as they will only get worse, but in the case of trees that are not much affected, or which it is desirable to retain, the wounds should be smeared with gas tar as soon as noticed.

Another form of attack consists in the birds picking the tissues (callus) formed along the edge of a wound, as for instance where a branch has been removed. Probably this form of attack is largely confined to oaks. Here the attraction is evidently the grub of a gall insect, whose chamber is formed in such tissues.

Markets and Fairs (Weighing of Cattle) Returns Order of 1905.

The Board of Agriculture and Fisheries have made an Order under the Markets and Fairs (Weighing of Cattle) Acts, 1887 and 1891, revoking previous Orders made under these Acts, and providing that the places from which returns shall be required to be made under the Markets and Fairs (Weighing of Cattle) Act, 1891, are to be as follows :—

PART I.

Aberdeen,	Glasgow,	London,
Carlisle,	Leeds,	Newcastle-upon-Tyne,
Dundee,	Leicester,	Perth,
Edinburgh,	Liverpool,	Shrewsbury.

PART II.

Ashford,	Dingwall,	Salford,
Ayr,	Elgin,	Selby,
Birmingham,	Gateshead,	Shifnal,
Bridgnorth	Hereford,	Stirling,
Bristol,	King's Lynn,	Stokesley,
Castle Douglas,	Lincoln,	Wakefield,
Chichester,	Northallerton,	Wellington (Salop),
Crewe,	Norwich,	Wolverhampton,
Darlington,	Oswestry,	York.

The market authority of every market held in any of the places specified, and every auctioneer who sells cattle, sheep, or swine at any mart where cattle, sheep or swine are habitually or periodically sold in any of the said specified places, shall on the last market day in every week send to the Board of Agriculture and Fisheries a return setting forth the number of cattle, sheep, and swine entering the market or mart, and the number of cattle, sheep, and swine weighed at the market or mart during the week, and also returns showing the prices of the cattle, sheep, and swine, fat and store respectively, sold during the week at the market or mart ; and such returns shall contain the particulars indicated in the forms specified for the markets included in Part I. and Part II. of the above list, copies of which are annexed to the Order, so far as the market authority or the auctioneer, as the case may be, can ascertain the same.

The Order, which may be cited as the Markets and Fairs (Weighing of Cattle) Returns Order of 1905, came into operation on the sixteenth day of January, 1905.

Welsh Translations of the Board's Leaflets.

In order to secure the circulation of certain of the Board's publications in all parts of Wales, the Board have caused the following leaflets to be translated into Welsh, and copies may be obtained for distribution among the Welsh-speaking community on application to the Secretary, 4, Whitehall Place, London, S.W.:—Farmers and Local Rates (No. 8), Farmers and Income Tax (No. 26), Anthrax (No. 28), Swine Fever (No. 29), Sheep Scab (No. 61), Workmen's Compensation Act (No. 66), Purchase of Artificial Manures (No. 72), Purchase of Feeding Stuffs (No. 74), Fluke or Liver Rot in Sheep (No. 89), Ringworm in Cattle (No. 95), Farmers' Co-operative Societies (No. 97). Copies of a Notice to Pig-owners in connection with the Swine Fever Order and of a Cautionary Notice as to Anthrax can also be obtained in Welsh.

A translation of the leaflet on the Feeding of Poultry is now being made, and will be published in due course.

Course for Migratory Teachers in Germany.

A short course of lectures for migratory teachers and others was held at Eisenach in April, 1904, under the auspices of the German Agricultural Society. The course was designed to provide a general view of recent progress in agricultural science, and was attended by 272 migratory teachers and 52 other persons. It comprised fourteen lectures, whilst at the evening meetings papers were read and explanations given of an exhibition of apparatus for agricultural instruction, such as collections of injurious insects, models of fruit and animals, diagrams, &c.

The subjects dealt with in the lectures included the laying down of land to grass, the use of various plants and grasses, their duration and effect on the herbage; nitrogen, the transformations it undergoes, and its use in agriculture; and the simple methods at the disposal of the farmer for enabling him to ascertain the manurial requirements of his land. On this point, Dr. Gerlach observed that it was too difficult a matter for the farmer to take into account all the factors connected with the chemistry, geology, mineralogy, and

bacteriology of the soil, its physical condition, position and climate, and there was at present only one method which could be used to throw light on the subject, viz., manurial experiments, and he urged the carrying out throughout Germany of comprehensive co-operative experiments. It is of interest to note, in this connection, that this method has been strongly advocated by the Board (see "Manurial and other Agricultural Experiments," issued March, 1903). In close connection with these lectures was that of Dr. Hiltner, who dealt with soil bacteriology, describing the progress of the past three years with regard to soil inoculation.

Other lectures dealt with the use of lime, its effect on the soil, its cost and profitable employment; new varieties of grain and other crops; judging of varieties of seeds by inspection of the growing crop; the progress of investigations into plant diseases; the protection of useful birds; cultivation of flax; fruit cultivation; and fish-farming.

Importation of Plants into the Transvaal.

The Board have received a copy of Regulations, dated November 10th, 1904, for preventing the introduction of insect pests and plant diseases into the Transvaal. The introduction from oversea into this Colony of any trees, plants, or portions thereof, except through the post and through the ports of Cape Town and Durban, is prohibited. Grape vines, coffee plants, eucalyptus, and coniferous plants from oversea and stone fruit trees from the United States and Canada are prohibited, as well as peach stocks and peach stones. The special permission of the Commissioner of Lands is necessary for the importation from oversea of trees, or any portion thereof, except in the case of fruit seed; plum stocks, pear stocks, and cherry stocks for budding or grafting purposes; blight-proof stocks and roots for apples; and citrus trees.

All trees and woody plants, cuttings or buds, are to be fumigated to the satisfaction of an inspector, and all other plants &c are to be inspected.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of January, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	England.		Scotland.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 8	7 5	37 3	34 5
Herefords	7 8	7 0	—	—
Shorthorns	7 7	7 1	36 5	33 6
Devons	7 8	7 1	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8	$7\frac{1}{4}$	$8\frac{3}{4}$	7
Sheep :—				
Downs	9	$8\frac{1}{2}$	9	$8\frac{1}{4}$
Longwools	$8\frac{1}{2}$	$7\frac{3}{4}$	$8\frac{3}{4}$	$7\frac{1}{2}$
Cheviots	$9\frac{1}{4}$	$8\frac{1}{2}$	9	8
Blackfaced	9	$8\frac{1}{4}$	$8\frac{1}{2}$	$7\frac{1}{2}$
Cross-breds	$8\frac{3}{4}$	8	$9\frac{1}{4}$	$8\frac{1}{4}$
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	5 8	5 4	5 6	5 0
Porkers	6 5	5 11	6 2	5 7
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—in Milk ...	20 13	17 14	21 4	17 12
,, —Calvers ...	20 0	17 11	19 2	15 15
Other breeds—In Milk ...	19 3	16 18	19 12	15 10
,, —Calvers ...	17 13	15 14	18 18	15 15
Calves for Rearing	2 4	1 14	2 3	1 11
Store Cattle :—				
Shorthorns—Yearlings ...	9 4	8 3	10 1	7 13
,, Two-year-olds	12 10	11 3	13 16	11 18
,, Three-year-olds	15 4	13 18	16 10	14 14
Polled Scots—Two-year-olds	—	—	15 17	12 13
Herefords— ,,	14 3	12 10	—	—
Devons— ,,	14 2	10 10	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs and Lambs—				
Downs or Longwools ...	43 5	38 10	—	—
Scotch Cross-breds ...	—	—	36 4	31 10
Store Pigs :—				
Under 4 months	23 8	15 4	22 3	16 5

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of January, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	52 6	51 4	49 0	52 6	56 0*	52 6*
	2nd	50 2	44 4	44 4	43 2	53 8*	49 0*
Cow and Bull ...	1st	—	42 0	43 2	43 2	45 6	40 10
	2nd	—	37 4	39 8	35 0	37 4	35 0
U.S.A. and Canadian :—							
Birkenhead killed	1st	51 4	50 2	47 10	51 4	47 10	50 2
	2nd	46 8	42 0	43 2	42 0	37 4	40 10
Argentine Frozen—							
Hind Quarters ...	1st	29 2	31 6	30 4	30 4	33 10	33 10
Fore ,, ...	1st	25 8	28 0	25 8	26 10	29 2	30 4
Argentine Chilled—							
Hind Quarters ...	1st	44 4	42 0	42 0	39 8	—	—
Fore ,, ...	1st	32 8	30 4	30 4	32 8	—	—
American Chilled—							
Hind Quarters ...	1st	56 0	52 6	51 4	54 10	54 10	53 8
Fore ,, ...	1st	37 4	35 0	33 10	33 10	37 4	36 2
VEAL :—							
British	1st	70 0	61 10	68 10	67 8	—	—
	2nd	59 6	51 4	61 10	56 0	—	—
Foreign	1st	70 0	—	60 8	57 2	—	65 4
MUTTON :—							
Scotch	1st	68 10	—	75 10	75 10	75 10	72 4
	2nd	63 0	—	65 4	65 4	64 2	57 2
English	1st	64 2	68 10	70 0	73 6	—	—
	2nd	58 4	50 2	64 2	61 10	—	—
U.S.A. and Canadian—							
Birkenhead killed...	1st	—	66 6	66 6	60 8	46 8	—
Argentine Frozen ...	1st	36 2	36 2	35 0	36 2	37 4	37 4
Australian ,, ...	1st	33 10	32 8	35 0	35 0	39 8	—
New Zealand ,, ...	1st	45 6	46 8	46 8	43 2	39 8	—
LAMB :—							
British	1st	91 0	93 4	—	—	—	—
	2nd	74 8	79 4	—	—	—	—
New Zealand ...	1st	63 0	—	—	59 6	—	—
Australian	1st	52 6	52 6	50 2	51 4	54 10	—
Argentine	1st	49 0	49 0	46 8	47 10	—	—
PORK :—							
British	1st	53 8	53 8	57 2	54 10	51 4	50 2
	2nd	45 6	44 4	50 2	44 4	49 0	40 10
Foreign	1st	50 2	47 10	47 10	47 10	—	43 2

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each of the under-mentioned Weeks in 1905, and in the corresponding Weeks in 1904 and 1903.

Weeks ended (*in* 1905).	Wheat.			Barley.			Oats.		
	1903.	1904.	1905.	1903.	1904.	1905.	1903.	1904.	1905.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 7 ...	24 11	26 6	30 4	24 1	22 6	24 4	17 0	15 7	16 3
,, 14 ...	24 11	26 11	30 4	24 1	22 3	24 6	16 10	15 9	16 3
,, 21 ...	25 0	27 3	30 5	24 1	22 4	25 0	16 11	15 11	16 5
,, 28 ...	25 4	26 11	30 6	24 3	22 3	25 1	17 0	15 8	16 7
Feb. 4 ...	25 6	26 9	30 6	23 9	22 4	25 0	16 11	15 11	16 7
,, 11 ...	25 6	26 8		23 7	22 2		17 1	15 9	
,, 18 ...	25 4	26 11		23 4	22 7		17 1	16 0	
,, 25 ...	25 3	27 10		23 2	22 4		17 1	16 3	
Mar. 4 ...	25 3	28 8		23 1	22 6		17 1	16 5	
,, 11 ...	25 1	29 1		22 10	22 5		17 0	16 8	
,, 18 ...	25 1	28 6		22 9	22 9		16 10	16 7	
,, 25 ...	25 2	28 2		22 4	22 8		17 0	16 7	
Apl. 1 ...	25 3	27 11		22 6	22 10		17 0	16 6	
,, 8 ...	25 4	27 10		21 10	22 5		17 2	16 5	
,, 15 ...	25 6	27 9		21 6	22 6		17 3	16 4	
,, 22 ...	26 1	27 9		21 9	22 0		17 9	16 4	
,, 29 ...	26 10	27 8		22 1	21 1		18 0	16 3	
May 6 ..	27 6	27 4		21 10	20 8		18 2	16 7	
,, 13 ...	27 9	27 1		22 5	19 10		18 4	16 6	
,, 20 ...	27 10	26 9		23 7	20 4		18 5	16 7	
,, 27 ...	27 8	26 9		23 7	19 8		18 5	16 7	
June 3 ...	27 6	26 10		23 10	18 8		18 4	16 8	
,, 10 ...	27 8	26 6		21 5	18 5		18 7	16 10	
,, 17 ...	27 6	26 5		20 7	18 2		18 3	16 8	
,, 24 ...	27 6	26 5		22 0	19 2		18 6	16 10	
July 1 ...	27 9	26 4		20 7	18 8		18 6	17 1	
,, 8 ...	28 1	26 6		19 11	19 8		18 3	17 1	
,, 15 ...	28 3	26 10		20 5	18 9		18 7	17 6	
,, 22 ...	28 7	27 7		20 10	18 10		18 5	17 6	
,, 29 ...	28 11	28 0		21 0	19 9		18 6	17 10	
Aug. 5 ...	29 3	28 3		20 1	19 9		18 8	17 10	
,, 12 ...	29 11	28 4		21 3	19 9		18 10	17 7	
,, 19 ...	29 9	28 8		20 4	22 5		18 6	16 7	
,, 26 ...	30 0	29 5		22 3	23 2		18 7	16 5	
Sept. 2 ...	30 3	30 2		22 5	25 3		18 5	16 3	
,, 9 ...	28 6	30 0		22 4	24 10		17 0	16 1	
,, 16 ...	27 5	29 7		24 2	24 9		16 4	15 11	
,, 23 ...	27 0	29 10		24 0	25 10		16 2	15 9	
,, 30 ...	26 3	29 10		23 9	25 5		15 9	15 8	
Oct. 7 ...	25 10	30 2		23 8	25 6		15 6	15 9	
,, 14 ...	25 8	30 5		23 9	25 4		15 5	15 8	
,, 21 ...	25 10	30 4		23 7	25 5		15 8	15 11	
,, 28 ..	26 0	30 6		24 2	24 11		15 8	15 10	
Nov. 4 ...	26 4	30 6		24 3	25 0		15 9	16 0	
,, 11 ...	26 6	30 3		24 6	24 6		15 9	15 11	
,, 18 ...	26 9	30 2		24 3	24 5		15 10	16 0	
,, 25 ...	26 6	30 5		23 11	24 4		15 11	16 1	
Dec. 2 ...	26 8	30 4		23 9	24 6		15 9	16 2	
,, 9 ...	26 7	30 4		23 2	24 4		15 9	16 2	
,, 16 ...	26 9	30 4		23 0	24 4		15 7	16 2	
,, 23 ...	26 5	30 3		22 5	24 7		15 6	16 1	
,, 30 ...	26 3	30 4		22 1	24 8		15 5	16 2	

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1904.	1905.	1904.	1905.	1904.	1905.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	January ...	35 10	39 11	22 4	23 7	16 9	18 5
Paris:	January ...	35 9	40 7	22 2	24 0	17 0	19 4
		1903.	1904.	1903.	1904.	1903.	1904.
Belgium:	November ...	28 7	31 4	21 6	22 9	15 5	21 6
	December ...	28 10	31 1	21 5	23 2	15 9	19 11
Berlin:	November ...	34 9	38 6	—	—	18 7	20 0
Breslau:	November ...	33 8	36 6	23 2	25 7	16 7	18 6

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets.*

AVERAGE PRICES of **British Wheat, Barley** and **Oats** at certain Markets during the Month of January, 1904 and 1905.

—	Wheat.		Barley.		Oats.	
	1904.	1905.	1904.	1905.	1904.	1905.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	27 6	30 11	21 2	23 9	16 3	17 5
Norwich	27 4	30 1	20 6	24 8	14 8	15 10
Peterborough ...	25 7	30 0	20 10	24 2	14 7	16 2
Lincoln	26 0	30 2	23 3	23 4	15 3	15 10
Doncaster	25 8	30 1	23 4	23 6	15 6	15 6
Salisbury	26 8	29 2	21 10	25 7	15 10	16 3

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of January, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British	15 6	13 6	—	—	—	—	15 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	96 0	94 0	—	—	93 0	86 0	—	—
Danish ...	110 6	108 0	111 6	108 0	110 6	107 6	110 0	109 0
Russian ...	98 6	95 6	—	—	—	—	—	—
Australian ...	100 0	98 0	102 6	99 6	100 6	97 0	103 0	99 6
New Zealand ...	101 6	99 6	105 6	102 6	102 6	100 6	104 0	99 6
Canadian ...	—	—	—	—	102 0	96 0	—	—
CHEESE :—								
British, Cheddar	72 0	61 6	—	—	68 0	62 0	58 6	55 6
			120 lb.	120 lb.	120 lb.	120 lb.		
" Cheshire	—	—	73 0	63 6	72 6	65 0	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	54 0	53 0	55 6	54 0	53 0	52 0	54 0	51 6
BACON :—								
Irish	58 6	52 6	54 6	51 6	55 0	50 6	55 6	52 6
Canadian ...	48 0	46 6	46 6	43 6	46 0	43 6	45 0	43 0
HAMS :—								
Cumberland ...	96 0	80 0	—	—	—	—	—	—
Irish	92 6	79 0	—	—	—	—	82 0	72 0
American (long cut) ...	45 0	41 0	46 0	41 0	44 0	40 0	44 0	41 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British	15 4	13 1	—	—	—	—	—	—
Irish	13 6	10 10	12 1	10 10	11 9	10 10	12 10	10 5
Danish ...	12 10	11 1	10 2	9 1	12 0	11 1	12 3	10 6
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Blackland ...	56 0	50 0	44 6	40 0	45 0	40 0	—	—
British Queen	66 0	60 0	—	—	—	—	—	—
Up-to-Date ...	66 0	58 6	63 0	51 6	46 6	36 6	60 6	51 0
HAY :—								
Clover	88 0	76 6	79 6	69 0	81 0	68 0	70 0	65 0
Meadow ...	77 0	60 6	63 0	58 6	57 6	45 0	70 0	63 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	JANUARY.	
	1905.	1904.
Swine-Fever:—		
Outbreaks	47	122
Swine Slaughtered as diseased or exposed to infection	170	714
Anthrax:—		
Outbreaks	82	83
Animals attacked...	165	106
Glanders (including Farcy):—		
Outbreaks	96	102
Animals attacked	172	219
Sheep-Scab:—		
Outbreaks	209	412

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	JANUARY.	
	1905.	1904.
Swine-Fever:—		
Outbreaks	3	9
Swine Slaughtered as diseased or exposed to infection	18	237
Anthrax:—		
Outbreaks	—	—
Animals attacked	—	—
Glanders (including Farcy):—		
Outbreaks	2	1
Animals attacked	4	1
Rabies (number of cases):—		
Dogs	—	—
Sheep-Scab:—		
Outbreaks	* 75	* 109

* The number of outbreaks in Dec., 1904, was 62, and in Dec., 1903, 110.

BOARD OF AGRICULTURE AND FISHERIES.

A Return of Market Prices of Fat and Store Stock, Dairy Cattle, Meat, Provisions, Fruit, Vegetables, Hay and Straw at certain representative Markets in Great Britain is issued *every Wednesday* by the Board of Agriculture and Fisheries, containing information for the week ending with the previous Saturday.

Price *One Penny* per copy, to be obtained either directly or through any bookseller, from WYMAN & SONS, LTD., Fetter Lane, E.C.; OLIVER & BOYD, Edinburgh; or E. PONSONBY, 116, Grafton Street, Dublin.

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DEPOSITS.—Any sum from a shilling upwards, excluding pence, may be deposited at one time, and any number of deposits may be made in the course of a year (ending December 31st) up to a limit of £50. A person may have £200 in all on his deposit account, including interest.

LIFE INSURANCES from £5 to £100 can be granted to persons between fourteen and sixty-five years of age. Children between eight and fourteen years of age can be insured for £5.

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Further information can be had at any Post Office Savings Bank, or on application to the Controller Savings Bank Department, General Post Office London.

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THE JOURNAL
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CALF-REARING.

From the calf's standpoint it may at once be conceded that there is no method of rearing a calf equal to the natural one of allowing it to run with its dam. But in these days, when the production of milk for sale is recognised as one of the most profitable sides of British farming and the only one not seriously affected by foreign competition, this simple plan of calf-rearing, at least with the dairy breeds of cows, will not pay. With the poorer milking breeds of cattle, such as the Herefords, Galloways, Highlanders, &c., calves are still largely allowed to run with the cows, but in such cases the farms are mostly or entirely in grass and not adapted for winter dairying, and the calving occurs in late spring or early summer when grass is available, and the cows are cheaply kept. Still, when it is considered that in the ordinary way a calf requires six quarts of new milk a day, the wholesale value of which is ninepence, while the market value of good stores of a year old only allows for half this daily outlay,* it will at once be seen that new milk continued for long is far too expensive a calf-food. In fact, at the rate of ninepence a day a calf is costing more to keep than a heifer near to her time of calving. Moreover, calves can be well reared as stores, and even well fed for veal with but a small consumption of new milk. In the case of pedigree calves, more especially the bulls, the higher anticipated sale prices generally justify the use of new milk up to even the age of twelve months; but good, well-grown bulls can be reared without much new milk.

* First value, £1 10s., and 365 times 4½d. = £6 16s. 10½d.; total, £8 6s. 10½d.

O O O

In this paper it is proposed to describe in detail the method that has been followed for nine years with considerable success on a north-country farm, where a herd of good milking Shorthorns is kept, and both butter and cheese are made.

The Calf-House.—This is a spacious "lean-to" building on the south side of a higher one, and is lighted by means of single panes of glass at regular intervals in the roof. The floor is of concrete, with no drains either open or covered. The two doors, each in halves, are on the same side, so that there may not be cross-draughts. The pens (6 ft. by 5 ft.) are on each side of a central gangway with board partitions not quite down to the floor, and palings in front, so that the calves may see each other across the gangway. Each pen contains a small trough and hay-rack.

Before a new-born calf is placed in its pen the floor is littered with an inch or so of well-broken moss-litter, and this is covered with a fair bedding of straw. A little extra straw is added day by day as required, and at the end of a week the pen is cleaned out. Afterwards moss-litter only is used, a bucketful being scattered on the top as frequently as it appears to need it; and the pens are cleaned out about once in three weeks. Moss-litter is such a good absorbent and perfect deodorant that no offensive odour is noticeable and no drains are required. When removed from the calf-pens it is still too dry to place on the manure heap, and forms an excellent substance to place round the heap to absorb the liquid draining from it, and when saturated it may be thrown on the top.

It will thus be seen that provision is made for comfortable and dry beds, sunlight, and fresh air, while an incentive is given to exercise on the part of the calves by the sense of companionship which they feel in seeing one another. These are conditions not difficult of attainment which should be aimed at in the construction of every calf-house.

The New-Born Calf.—The calf, as soon as it is "dropped," is removed to its pen, and neither calf nor dam appears to seriously notice the separation. The hollow of the hand of the attendant is filled with carbolic oil (1 part Calvert's No. 4 carbolic acid to 19 of Galipoli oil), and this is applied freely to the calf's navel to prevent the absorption of microbe germs, which often pro-

duce festering, white scour, navel-ill, &c. ; it is especially important to take this precaution if the navel-string has broken off short. Occasionally the cord is so broken that the navel appears as an open wound, in which case the two edges should be drawn together with a needle and thread previously dipped in carbolic oil, and in a few days the place will have healed.

The calf is now rubbed down with a wisp of straw and allowed to lie covered over with straw till its mother has been milked. In the natural way, the calf would not suck the cow until it got well on its feet, and there need be no hurry for half an hour or so to give it its first meal when separated from the cow, in mild or warm weather ; but in cold weather it is very important that it should have a drink of warm milk as soon as possible. The writer has never known a new-born calf take a chill even on the coldest winter night, in spite of the sudden change in the temperature of its surroundings, when thus promptly attended to. In all cases milk should be given to young calves at the blood-heat of the cow (101 deg. to 102 deg.), which is the temperature at which a calf would get it from the cow by sucking. Now by the time the milk has streamed through the cold air into the cold milk-pail it will be at least 10 deg. below this, and will therefore need a little heating, either by addition of a little hot water or otherwise. Whilst speaking of the temperature of milk, it may be well here to give a special caution against serving milk too hot either at this stage or later ; it is far better to err on the side of not having it warm enough than of having it really hot.

The two forefingers are placed in the calf's mouth, and the hand is lowered into a bowl of the colostrum (first milk), and, usually, the calf at once sucks away vigorously, but sometimes a little patience is required before it discovers its ability to suck. A quart is sufficient for the first meal, and most calves readily take this amount, and many would take more if allowed. Colostrum or "biestings" differs in many respects from ordinary milk, for it contains about five times as much albuminoid (lean, hair, and other tissue-forming) matter, and nearly twice as much mineral (bone-forming, &c.,) matter. Further, the albuminoid matter instead of being mainly in the form of curd (casein), as in milk, is chiefly in the form of albumen

(white of egg), which will not curdle on the calf's stomach, and practically needs no digesting ; it, however, coagulates with heat, so that in warming "biestings," care should be taken not to allow it to get really hot. The old-fashioned custom of giving a new-born calf an egg is, therefore, like "sending coals to Newcastle," for albumen is abundant in the colostrum already. This first milk also has mild aperient properties suitable for putting the calf's bowels in working order, and it is not necessary to give a new-born calf castor oil, Turkey rhubarb, or other opening medicine. In the course of about five days colostrum has gradually assumed the character of ordinary milk, but it sometimes happens that a newly-calved cow is sold a day or two after calving, or a calf a day or two old is purchased, or the cow dies from bleeding at calving, and no colostrum is available for the calf; a useful substitute for the first three days may be made by whipping up an egg with half a pint of warm water, adding half a teaspoonful of castor oil, and stirring in one pint of new milk, for each meal.

Dietary.—The calf gets three meals of milk a day, viz., at 6.30 a.m., 12.30 p.m., and 5.30 p.m., until it is eight weeks old, that is, until it eats hay freely, and will go to its hay-rack when hungry. It is most unnatural for infant animals to go long without food during the day, and the daily allowance of milk given at two meals instead of three often causes acidity, wind, and indigestion in the stomach, and, as a result, diarrhœa (scour).

On the third day the use of the fingers is discontinued and the calf is made to drink from a small pail, and by this time it takes greedily two quarts at each meal. At the end of a fortnight half the new milk is discontinued, and the meal now consists of one quart of new milk and three pints of separated milk, with a cream substitute. Three cream substitutes have been used with most satisfactory results, viz. :—

(1) *Boiled Linseed.*—Put 2 lb. linseed to soak over night in three gallons of water, boil and stir the next day for twenty minutes, and five minutes before the boiling is finished add $\frac{1}{2}$ lb. of flour (previously mixed with enough water to prevent it being lumpy) to this gruel to counteract the laxative tendency of the linseed. This will keep sweet for many days, and may,

therefore, be made in considerable quantity; one pint of this gruel should be added to four pints of separated milk.

(2) *Ground Linseed.*—Obtain the unground linseed to ensure having the whole of the oil, and have it ground by ordinary millstones. It will be necessary to add one part of Indian meal to seven of the linseed to prevent it clogging the mill. Scald and stir with boiling water at the rate of one quart of the meal to one gallon of water. This makes a porridge of much nicer consistency than the boiled linseed, and is more quickly and easily prepared; use one pint of this porridge to four pints of separated milk. People frequently use linseed cake meal for making a calf porridge to add to skimmed or separated milk, but, although a wholesome food, it must not be imagined that it enriches the milk with fat as linseed itself does, for linseed cake would not have more than 12 per cent. of oil, whereas linseed contains 32 per cent.

(3) *Cod-Liver Oil.*—The genuine article answers admirably, and gives practically no trouble; and when it can be bought at 4s. 6d. per gallon it is a cheap cream substitute. A tablespoonful is measured into a calf bucket, and the warm separated milk for one meal poured on to it, and the mixture poured into another bucket to well mix or emulsify the oil, and it is at once served to the calf. A calf thus gets three tablespoonfuls a day, or half this quantity during the second fortnight, while having part new and part separated milk. But, latterly, cod-liver oil has been very dear, and much that has been sold as genuine is so impure and has such a vile smell that it awakens the suspicion that it consists largely of crude fish oil, which is certainly unfit for calves.

All things considered the use of (2)—the scalded ground linseed—seems preferable, which at 1s. 9d. a stone will scarcely cost 3d. a week, or 1s. 6d. altogether for each calf.

New milk is discontinued at the end of the first month, and for the next month the allowance of separated milk for each of the three meals is three quarts with cream substitute. If the calf is intended for veal a pint more milk than this is given, and the fattening is hastened by a further addition of boiled flour or oatmeal to the milk, or even a good dessert-spoonful of sugar. Calves not intended for veal have sweet meadow hay supplied

them in the fifth week, at which age they begin to chew the cud. At the ninth week the mid-day milk is replaced by a good handful of linseed cake (6 oz.), and the calves get a good drink (five quarts) of separated milk morning and evening without cream substitute. As they get older the hay and linseed cake are gradually increased until in its fifth month the calves get half a pound of linseed cake a day and eat about 5 lb. of hay. A little crushed oats ($\frac{1}{4}$ lb.) is now added to the cake, and sliced swedes. At six months old milk may be discontinued altogether, but gradually, the evening's milk being first stopped; in fact, all food-changes with calves should be gradual.

Calves born before March are turned out to grass as soon as the weather is mild (June probably), but do not lie out at night until hoar frosts are well at an end, and they continue to receive their daily allowance of linseed cake and meal. Calves born in the spring and summer months are not turned out that year, experience having shown that these calves thrive much better off the grass, escape that very troublesome calf disease—hoose, and turn out better stores the following spring. Indoor calves begin to receive green-meat, such as cut grass or vetches, in the summer, and sliced swedes in the winter, when five months old; and their feeding during the second half of the first year simply consists in foddering with hay and serving with cut swedes morning and evening in steadily increasing quantities, giving cake and meal at mid-day up to 1 lb. of cake and $\frac{1}{2}$ lb. of meal per head at the age of from nine to twelve months, and letting out to water and exercise at 10 a.m.; a lump of rock-salt lies at each end of their trough for them to lick. Regularity of feeding is a matter of prime importance in the management of all kinds of cattle.

The calf dietary for the first six months as above described may be shortly tabulated as follows :—

First week.—Its own mother's warm milk three times a day, commencing with about a quart and increasing to two quarts by the third day.

Second week.—Two quarts of warm new milk (not necessarily its own mother's) three times a day.

Third week.—Two pints of new and three pints of skim (or separated) milk, three times a day with half a pint of linseed porridge or half a tablespoonful of cod-liver oil.

Fifth week.—Three quarts of warm skim milk three times a day, with one pint of linseed porridge or one tablespoonful of cod-liver oil, and a little sweet meadow hay, increased week by week.

Ninth week.—Omit mid-day milk and cream substitute. Give five quarts of separated milk morning and evening, a handful of broken linseed cake (6 oz.) at mid-day, and hay, increasing week by week.

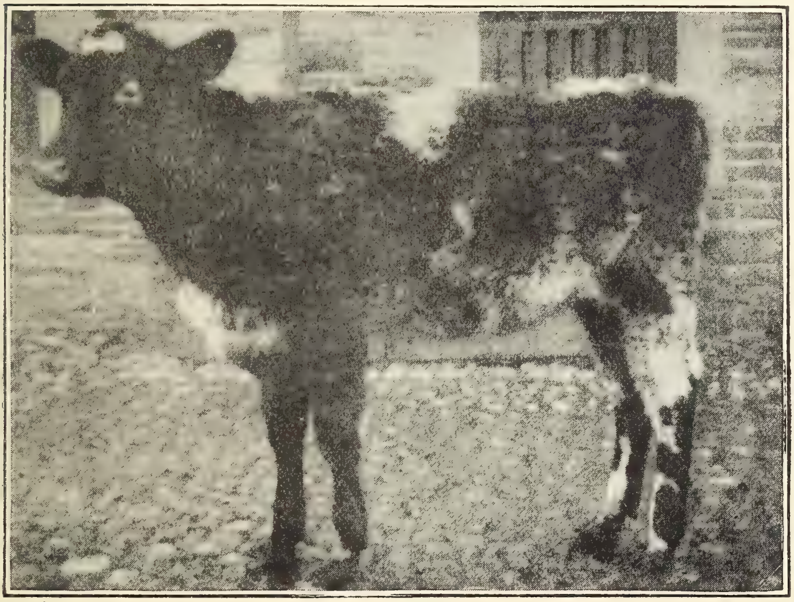


FIG. 1.—HEIFER CALF, 6½ months old, weighing 3 cwt. 3 qrs. 13 lb.

Thirteenth week.—Milk as before, ¾ lb. mixed linseed cake and crushed oats, ½ gallon pulped swedes (green-meat in summer), gradually increasing, hay *ad lib.*

Twenty-first week.—Milk as before, 1 lb. of mixed linseed cake and meal, increasing quantities of hay and roots.

Twenty-fourth week.—Discontinue evening milk.

Twenty-seventh week.—Discontinue milk altogether.

Although skim-milk is somewhat richer in fat than separated milk, yet the latter has an advantage over the former in being

perfectly fresh and sweet when given to the calves, and if served to them morning and evening shortly after being separated, needs no warming. It will pour into the calf pail clear of the froth if allowed to stand for a short time, or the froth may be held back with the hand.

Cost.—The cost of rearing a calf for a year under this system is as follows :—

			£	s.	d.
For first 12 weeks.—	120 quarts new milk at 1½d.	=	0	15	0
	Linseed meal	=	0	1	6
	150 gallons separated milk at 1d. ...	=	0	12	6
	6 stones of hay at 4½d.	=	0	2	3
	12 lb. American linseed cake at £7 15s. a ton	=	0	0	10
For next 14 weeks.—	220 gallons separated milk at 1d.	=	0	18	4
	49 lb. American linseed cake at £7 15s. a ton	=	0	3	5
	32 lb. crushed oats at 8d. a stone ...	=	0	1	6
	10 stones swedes at ½d.	=	0	0	5
	30 stones of hay at 4½d.	=	0	11	3
For remaining 26 weeks.—	182 lb. linseed cake at £7 15s. a ton	=	0	12	7
	91 lb. crushed oats at 8d. a stone ...	=	0	4	4
	91 stones of hay at 4½d.	=	1	14	1
	70 stones of swedes at ½d.	=	0	2	11
			£6	0	11

Bullock calves thus reared sell at a year old at the local spring sales of store cattle easily at £8 5s. each, thus paying the *market* price (less the cost of marketing) for home-grown produce eaten, 6d. a gallon for the new milk, and 1d. a gallon for the separated milk consumed, leaving £2 4s. for the first value of the calf and a small margin for risk. The manure produced may be taken as a set-off against the value of attendance and litter. In the case of well-bred heifer calves intended for breeding the value at a year old would be considerably above this store price.

In rearing young bulls it is only necessary to continue the linseed porridge with the separated milk for, say, six weeks longer than with other calves, and the separated milk alone to the end of the eighth month, at the same time doubling the quantities of linseed cake and meal. This will involve an extra expenditure of 35s., while if the calf has been well selected

at the commencement he will easily realise £5 or £6 more at a year old than an ordinary store bullock of the same age.

Milk Substitutes.—On milk-selling and cheese-making farms separated milk is not available, and without it calf-rearing becomes a difficulty; not that it is difficult to devise from a table of food-stuffs a calf meal that shall closely resemble milk in its digestible constituents, but it cannot be done without at the same time introducing a much larger amount of indigestible matter than occurs in milk; the consequence is that, as a rule, calves reared on calf meals alone are "pot-bellied," badly-grown

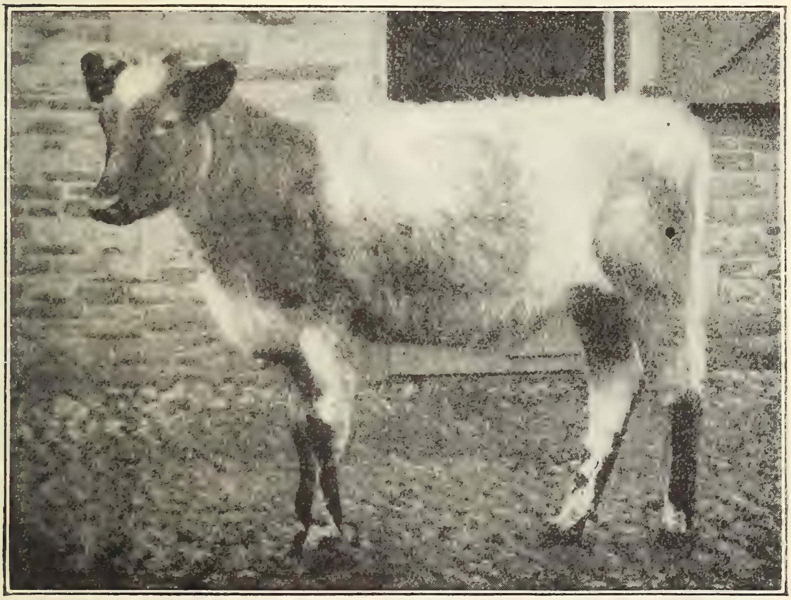


FIG. 2.—HEIFER CALF, 10 months old, weighing 5 cwt. 1 qr. 10 lb.

animals, instead of having the well-grown, level-fleshed, and alert appearance of milk-fed ones.

This question of indigestible matter, and that of choosing meals that will agree with the calf, constitute the practical difficulties; and yet probably most milk-sellers and cheese-makers would be glad to rear the heifer calves from their best milking cows if there was a fair prospect of doing so successfully with very little milk. The following meals have proved to be good milk substitutes, and, used as directed, provide an albuminoid ratio about the same as that in new milk:—

CALF MEAL NO. 1.—To be used when a small quantity of separated milk is available :—

8 parts of oatmeal (by weight).
1 part of ground linseed.

Scald $2\frac{1}{4}$ lb. over night with five pints of boiling water, boil for ten minutes next morning, and add five pints of separated milk with about $\frac{1}{4}$ oz. of salt and 2 oz. sugar.

NO. 2.—When no separated milk is available :—

2 parts linseed cake meal.
2 parts oatmeal.
1 part ground linseed.

Mix 3 lb. with five quarts of boiling water over night, and boil for ten minutes next morning; serve with salt and sugar as with No. 1.

NO. 3.—Requiring no boiling :—

14 parts linseed cake meal.
5 parts ground linseed.
2 parts wheat flour.
2 parts locust bean meal.

Mix 3 lb. with five quarts boiling water and a sprinkle of sal

Each of these is the day's allowance for a calf, and should be given warm at three meals to one under three months old, and at two meals above that age. Where No. 2 or No. 3 is used it should be introduced and the new milk reduced very gradually thus :—

First week of calf's life its own mother's milk only.

Second and third weeks three pints of new milk and one pint of the gruel at each of three meals.

Fourth and fifth weeks two pints new milk and two pints gruel.

Sixth and seventh weeks one pint new milk and three pints gruel.

Eighth week two quarts of gruel and no new milk.

Hay, of course, would be introduced, as with other calves, at the fifth week.

Common Ailments.—All sucklings have the habit of sucking anything that comes near their mouths, and calves, perhaps, more than others, and this habit often proves a serious source of ill to the calf and loss to its owner. If together calves suck each other and get an accumulation of hairs in the stomach, which appears to form the nucleus of a hard curd ball that eventually causes death : this may be prevented by keeping them in separate pens until they eat hay well, that is, for the first two months. It sometimes happens, too, that while lying they get in

the habit of sucking their bedding and swallowing considerable quantities ; when it consists of straw it may be bad enough, but when it is moss-litter it is worse ; and the writer has had one case of a calf dying from eating this latter substance. A simple means of prevention is to muzzle the calves until they begin to eat hay. Muzzles should also be used where small calves cannot be accommodated with separate pens.

During the first two or three weeks that calves are having new milk they are liable to "white scour,"* which frequently

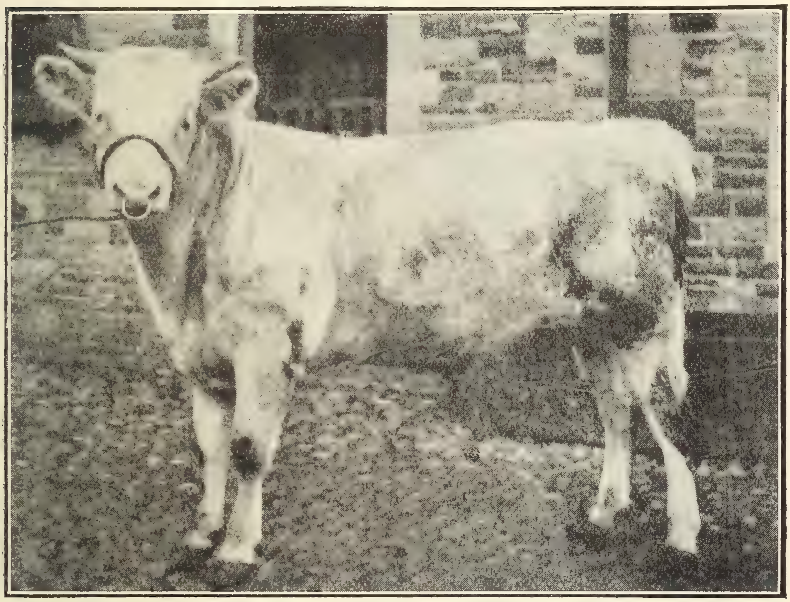


FIG. 3.—BULL CALF, $12\frac{1}{2}$ months old, weighing 8 cwt. 0 qrs. 15 lb.

proves fatal. Generally the first symptom is hesitation to take their milk ; when this occurs a dose of castor oil should be given instead of the milk—a tablespoonful emulsified in twice as much warm water. It is best administered from a small, thick bottle, such as a "gaseous fluid" bottle, put into the calf's mouth, well over the tongue. This prompt treatment generally sets ordinary stomach or bowel derangements right, and often "white scour"; should it, however, not restore the appetite and correct matters, follow with one-third of a bottle of "gaseous fluid."

* See Leaflet No. 101, "Prevention of White Scour in Calves."

Ordinary scour in young calves is due to acidity, which may be corrected by a dose of bicarbonate of soda, or adding lime-water to the milk.

For a cold or chill wrap a cake-bag round the calf to keep it warm, and give a dessert-spoonful of sweet spirits of nitre in a little warm water.

Loss among calves is often attributed to the use of cotton cake with the cows, but at this farm the cows when housed get in the regular way 4 lb. of decorticated cake each per day, and for the latter half of the summer 2 lb., and yet, with the exception of one calf that died from eating moss-litter, one from inflammation of the lungs, and three while receiving the vile-smelling cod-liver oil above referred to, there have been no losses in nine years out of a total of 180 calves born. It should, however, be stated that when a cow's milk falls to five quarts a day, cake is entirely discontinued, as she does not pay for it and can be kept in good condition without it; so that, practically, no cow gets cotton cake for at least two months previous to calving; nor does she get cake in the week following; but after the first week of its life, a calf is fed with the milk of any cow, or with the milk of several, that are receiving the usual allowance of cotton cake.

WM. T. LAWRENCE.

THE WINTER AND THE WHEAT CROP.*

It seems early days yet to be speculating about the probable yield of the wheat crop in 1905, still there are certain considerations which may even now be taken into account. Perhaps they are more of a negative than of a positive nature, so many are the changes and chances to which the plant will be subject before it comes to harvest six or seven months hence. By negative is meant that it was very easy at this time last year

* This note had been written, except the figures for February, 1905, before the appearance of the report (*The Times*, February 7th, 1905) by Mr. W. N. Shaw, F.R.S., Secretary to the Meteorological Office, in which he traces a very close agreement between the autumnal rainfall (September, October, November), and the subsequent wheat crop. It has been thought better not to recast the note in the light of Mr. Shaw's conclusions, but to let it stand as indicating one factor in the wheat yield.

to be certain that the wheat crop of 1904 would be a very poor one, as indeed it proved to be, despite the generally favourable weather from March onwards. At the present time all one can be justified in saying is that an excellent foundation has been laid, and that unless the conditions take a really bad turn we are in the right train to obtain a heavy crop. We may now proceed to set out the reasons for so rash a prophecy, and we can best begin by a table (No. I.) showing the meteorological conditions for the winters of 1903–4 and 1904–5. The figures, which are derived from the Rothamsted records, show for the first five months, October to January inclusive, 1st, the rainfall; 2nd, the percolation as measured by the amount of rain-water finding its way through sixty inches of bare soil; 3rd, the quantity of nitrogen as nitrates washed out by the water percolating through this gauge and calculated as pounds per acre; and 4th, the number of days on which the drains of the wheat-field ran. It should be explained that the Broadbalk wheat-field is tile-drained beneath each plot at a depth of thirty to thirty-six inches, all the drains being led into a transverse trench across the lower end of the field, and records are kept of the dates and times when each drain runs.

TABLE I

RAINFALL AND PERCOLATION AT ROTHAMSTED, 1903–4 AND 1904–5.

—	Rainfall.		Percolation through 60 inches of soil.		Nitrogen as nitrates in drainage water.		No. of days on which drains ran in wheat-field.	
	Inches.		Inches.		Lb. per acre.		——	
—	1903–4.	1904–5.	1903–4.	1904–5.	1903–4.	1904–5.	1903–4.	1904–5.
Oct. ...	6·32	1·37	5·09	0·36	8·06	0·71	8	0
Nov. ...	2·21	1·67	1·81	0·89	2·41	2·07	3	0
Dec. ...	2·42	2·48	2·11	2·13	2·73	4·87	5	5
Jan. ...	3·50	1·34	3·39	0·76	4·22	1·52	6	0
Feb. ...	3·44	0·95	3·49	0·22	3·16	0·39	11	0
Total	17·89	7·81	15·89	4·36	20·58	9·56	33	5

Dealing with the meteorological returns first, the contrast between the two winters is very striking. Agriculturists will

long remember the dreary close of 1903: for weeks the land was saturated, and it was with difficulty that the wheat was sown during a short spell of dry weather in mid-November. Indeed, on the heaviest soils it was not possible to prepare a seed bed at all, and the diminished acreage returned as being under wheat in 1904 only reflects the weather conditions which prevailed towards the close of 1903 and early in 1904. It will be seen that the water passing through the drain gauge was a very large proportion of the rainfall, and this, together with the frequency with which the tile drains ran, means that the ground must have been practically in a saturated condition during the whole of the winter. The contrast presented by the current winter is very great: after a dry September, both October and November were very dry months, in which nearly the whole of the rainfall was retained by the surface soil, and though the drains did run vigorously once in December the soil was in the main dry up to the end of February. The early harvest and the dry September enabled farmers to get well forward with their cultivations, so that most men got the bulk of their wheat sown in October or early November. Actually, too, an exceptionally large acreage appears to have been sown, for men were tempted by the high prices prevailing and the excellent seed bed that could be obtained with a minimum of labour.

We can almost divide the life of the wheat plant into three stages: until March the growth above ground is small, and the plant is almost wholly occupied in developing its root system; then comes a period of growth which lasts almost up to the flowering, after which the plant as a whole no longer increases in weight, but is busy transferring the material it has already formed from the stem and leaves to the seed.

Now the future of the plant depends very largely upon the development of a good root system to begin with, and roots will not form in a saturated soil. Not only is there a lack of air to stimulate them, but because there is such an ample supply of water many roots are not required to keep the plant supplied whereas in a dry soil the roots must spread and ramify in order to maintain a proper supply of water to the plant. Some experiments of Seelhorst's illustrate very well the dependence

of root growth upon a fairly dry condition of soil. He grew two lots of barley in pots containing the same kind of soil, maintaining the soil water in one case at almost 76 per cent., and in the other at about 49 per cent. of the maximum water content of the soil. As a result the barley in the drier soil developed twice the weight of roots as did the barley grown under wetter conditions.

It follows, then, that if we have a saturated soil throughout the winter the wheat plant will make a poor foundation of roots, and from this bad start it can never recover; in other words, wet winters are invariably followed by poor wheat crops. In Table II. the experimental wheat crops for the last thirty-four years have been divided into two lots according to whether the winter rainfall and percolation have been above or below the average, and the figures show the average rainfall and percolation for the group of winters which was above and that which was below the average. Lastly come the yields which were associated with these two series of years, and it will be seen at once how marked has been the effect of the winter's rain upon the crops of the following harvest. It is clear, indeed, that the earlier months of the wheat's growth are amongst the most critical, and the crop is largely made or marred at this early stage in its history.

TABLE II.

Comparison of 10 wettest and 10 dryest winters (1852–1902), Rothamsted.	10 Wettest.	10 Dryest.
Rainfall, Nov. to Feb. inclusive ... inches Average crop per acre, plots 6, 7, 8... bushels	13·01 26·2	5·79 34·9
Comparison of winter percolation with crop 1870–1904.	19 Winters above average.	15 Winters below average.
Percolation through 60 in. bare soil, Nov. to Feb. ... ... inches Average crop per acre, plots 2, 6, 7 ... bushels	9·43 26·8	5·02 31·5

Another factor in the yield is the extent to which the autumn formed nitrates are allowed to remain in the soil by the winter rains. The wheat crop, though very dependent on the supply

of nitrogen, rarely receives any direct manuring; its nitrogen has to come from the residues of previous crops, and since the land gets no cultivation after the sowing of the seed, the process of nitrification, which depends very much upon the aëration and stirring of the soil, is comparatively slow after the first great production of nitrates when the land is broken up in autumn. Hence, if there is much washing out of nitrates from the soil in winter, the wheat crop, more than any other, will suffer, for in its case there will be little opportunity of repairing damages. The third column in Table I. shows the enormous losses of nitrates which the soil suffered during the winter of 1903 as far as they can be measured from the nitrates determined in the Rothamsted gauge, where the water percolates through sixty inches of soil. As the soil in question has not been manured for the last thirty-five years, and has always been losing nitrates year by year, it is in a highly impoverished condition, so that its production of nitrates will be much smaller than that of a piece of land in ordinary good heart. Yet this unmanured piece lost nitrates equivalent to 130 lb. of nitrate of soda per acre in the five months October, 1903, to February, 1904, as compared with 61 lb. up to a corresponding date this winter.

The bad wheat crop of 1904 could then have easily been predicted in January last, and could have been foreseen with certainty at the end of February. Both causes of a small crop had been operating together: a late seeding and a saturated soil involved a poor root development, and the great percolation had washed away most of the nitrates which were the only source of nitrogen available for the crop. The present season offers the greatest possible contrast: the early harvest, the well-ripened seed, the dry October and November, gave the plant an early and a vigorous development, so that it had no doubt already assimilated much of the available nitrate before the December rains became heavy enough to cause any washing of salts through the soil. It is, of course, impossible to predict a heavy crop—there are many possibilities of disaster between now and harvest—but we can say that a good beginning has been made, and that, granted fairly normal conditions during the next six months, we may safely expect a good crop of wheat. But, as said before, the negative side is stronger than the

positive; while it was easy to predict disaster a year ago at this time, it is not so easy to be sure of success in the future, however good the present prospects may be.

A. D. HALL.

THE PREPARATION OF HONEY FOR MARKET.

The bee and honey classes of the shows now held during each season, both in London and the country, have taught the consumer what to require in a first-class honey. Comb-honey (in section cases) should be translucent, showing the clarity and light colour of the contained honey, evenly and delicately worked out to the sides and bottom of the section, and with a scrupulously clean surface. The finest liquid, extracted-honey, should be bright and clear, of a light straw colour, and delicate in flavour and aroma. Granulated extracted-honey should be of fine, even grain, creamy white in colour, and of good flavour. There are many grades of medium and dark-coloured honeys below this first-class standard, but the latter is what the bee-keeper must strive to attain, in order to command a ready sale for his produce.

In regard to comb-honey, the preparation commences with the fitting of the wax foundation in the section boxes. To ensure a well worked out section this should be cut so as just to clear the sides of the box and hang to within one-sixteenth of an inch of the bottom, thus allowing for a slight stretching of the foundation caused by the heat of the bees clustering on its surface. The fitted boxes must next be placed in the section rack, with separators between the rows, reaching to within three-eighths of an inch of the top and bottom, and wedged up perfectly square and tight; this is important, for the bees will place propolis over every crack or small space, causing disfigurement and extra work in cleaning; also sections "out of square" are much more liable to breakage when packed for travelling, owing to the unavoidable spaces between them. The rack must be placed perfectly level on a hive containing a strong colony of bees, it will then be filled with good, straight, and even combs. Removing filled racks from the hives should be done with as little disturbance to the bees as possible: the best method is to place a "super-clearer" on a stool or box by the side of the hive,

raise up the bottom edge of the rack and insert a small wedge: puff a little smoke between the rack and tops of the frames, then remove the rack steadily with a screwing motion, and put it down gently on the "super-clearer"; place a cloth, on which a few drops of carbolic acid have been sprinkled, over the top of the frames, and in about ten seconds remove it, the bees will have been driven down, leaving the tops clear; then immediately take up the rack with the "super-clearer" and place them on the frames. If this operation is carried out in the afternoon, by next morning every bee will have found its way down to the body of the hive through the bee-escape in the centre of the "super-clearer," and the rack can be removed with comfort to the bee-keeper and without disturbance to the apiary. When sections are taken out of the racks while the latter are still on the hives or full of bees, the disturbed bees will frequently pierce the cappings in many places to gorge themselves with honey, and wherever this happens "weeping" will be caused when the sections are kept for any length of time in store.

The full racks should be carried into a bee-proof room, the wedges and back-board removed, and the centre section of the exposed row taken out. Do not attempt to lift it straight out, the result would probably be a damaged section, but tilt it backward on its bottom edge, and when loosened it will come away easily, as also will the two side ones. Sort the sections as they are taken out, putting all well filled clear ones as the first grade; those not well worked to bottom and sides, and therefore not fit for travelling, make a second grade, and any only partially filled must be given back to the bees to finish, unless the "honey-flow" has ceased, and in that event they must be emptied by the extractor. Carefully scrape all propolis from the edges of the sections and, if not already sold, store them in a dry, warm cupboard, protecting them from dust by tying in packages of four or six in clean paper; be very careful not to place anything having a strong odour near the honeycomb, or it will spoil the flavour.

If the sections are sold to wholesale dealers for re-sale to traders, no further preparation is needed. To pack them so as to travel safely, not more than from four to six dozen should be put into one package, preferably the smaller quantity. Procure

a strong wooden box, bore two holes in each end, about one-third down, and knot firmly into them rope handles, by which the box can be safely and easily lifted ; put into the bottom of the box a bed of coarse hay, and on this place, quite close together, a layer of the wrapped-up packages of sections, leaving at least two inches between the sides of the box and the sections : this space must be filled with hay, tightly pressed in, and, to prevent possible damage to the comb, the ends of the packages may be protected by pieces of straw-board or thin wood ; continue with layers of packages, filling in round the sides as before, until within two inches of the top, then fill up tightly with hay, and *screw* on the lid. Label the package plainly : "Comb-honey, With Care." Retailers of honey-comb prefer to have the sections sent to them glazed, it preserves the comb from injury by careless handling, and, what is still more important, it is kept free from the dusty impurities unavoidably present in shops.

For glazing sections, glass cut to the correct size may be purchased of any dealer in bee appliances, together with the strips of paper lace edging, which, when pasted round the angle formed by the glass and wood, serve to fix the glass on. In country towns the local glazier will gladly cut up waste glass to the small size (viz., $4\frac{3}{16}$ in. by $4\frac{3}{16}$ in.) required, and neatly printed bands of coloured paper, 19 in. by 3 in., can be used instead of the lace edging: they cost about 7s. per 1,000. These bands are more easily pasted on, and make much firmer and neater work, besides giving an opportunity to place the names of the apiary and retailer on each section. Neat card-board cases, plain or glazed on one or both sides, and glazed tin boxes, are provided by appliance dealers for those who have but a small number of sections to deal with ; where larger quantities have to be handled, the printed band holding on the two squares of glass will be found the best and most economical.

The modern method of obtaining "extracted" or "run" honey has greatly improved its quality, but the use of the centrifugal extractor demands the abandonment of the skep system of bee-keeping, with its waste of bee life, waste of combs, and taint of sulphur, and the adoption of the frame hive which enables the gathered surplus to be stored in frames apart from the brood-nest and removable at will by the bee-keeper.

Honey improves in flavour and density while ripening in the hive, therefore the super-frames should not be removed until they are well sealed over. If the bees are given all the storage room they can occupy, so long as there is nectar to be gathered they will bring it home quite irrespective of the quantity already in store. It is a mistake to suppose that by extracting unripened honey and returning the empty combs the bees are induced to work more vigorously.

Fermentation is the great enemy of extracted honey, but it can only affect badly ripened honey or honey exposed to moisture and warmth ; so, should it be necessary to extract unripe honey, it should be returned to the bees for re-storing and ripening. Extraction is done by means of a machine consisting of a tinned-iron can, within which is a vertical spindle carrying a pair of cages to hold the frames of honey-comb and made to revolve rapidly by means of a simple hand-gear. Before placing the frames of comb in the cages they must be uncapped. To do this quickly and without waste special uncapping knives are used ; they should be heated in a tin of water kept hot over a small spirit or oil lamp. The full frame, held by one lug in the left hand, the other lug resting on a large dish and with the top edge overhanging, has its capping removed with the sharp, hot knife by a gentle, slightly sawing, downward cut, passing just beneath the surface and removing as little as possible of the honey. If held with sufficient overhang the detached sheet of capping will fall clear of the frame. A pair of frames having been uncapped they are placed in the cages of the extractor and made to revolve rapidly with their bottom bars leading ; the centrifugal force throws out the honey, and when one side has been emptied the frames are reversed and the other side treated in the same manner.

The full sealed frames of comb having been carried into the store-room should be sorted by holding up to the light, and all those containing dark or second quality honey separated from the better ones.

Uncap and extract the contents of the best combs, and then strain the honey through a bag made of cheesecloth which will remove all loose particles of wax. Tin cans, with strainer and honey tap, made to contain 56 lb. or 112 lb., can be obtained,

in which, if the honey is allowed to stand for twenty-four hours after straining, it will be freed from air bubbles, and can then be drawn into whatever bottle, jar, or tin will best suit the local market. Best honey is usually put into 1 lb. or ½ lb. glass jars, with metal screw lids having a cork wad inside the lid. To prevent any leakage the cork wad should be dipped in melted wax and placed on the jar while still warm, the lid being screwed down upon it. A neat label (of which a variety are always obtainable from the appliance makers or of the Secretaries of many of the County Bee-keepers' Associations) will set off the honey jar and make it a desirable occupant of a place in any retailer's shop. The darker honey is more suitable for marketing in its granulated state; when extracted and strained it should be run into 14 lb. or 28 lb. tins, the contents of these being stirred gently, now and again, while granulating; the stirring tends to produce a more even and finer grained honey. It may also be run into wide-mouthed glass or earthenware jars, covered down with parchment paper, and stored in a cool, dry place. Dark and coarse flavoured varieties can be sold for manufacturing and confectionery uses, also for that now almost forgotten purpose, the making of mead.

T. J. WESTON.

SOIL INOCULATION IN THE UNITED STATES.

The investigations into the subject of soil inoculation in the United States by Dr. George T. Moore, of the Department of Agriculture, were referred to in the previous number of this *Journal* (February, 1905, p. 671), and an account was given of the method of preparing the inoculating material. The Board have now received from the United States Department a bulletin* on soil inoculation, containing the reports on the use of these artificial cultures by practical farmers.

The bulletin opens with a brief historical sketch of the work that has been done in investigating the question of the fixation of nitrogen by the root nodules of leguminous plants and of the experiments which led up to the preparation of "nitragin"

* Soil Inoculation for Legumes, United States Department of Agriculture, Bureau of Plant Industry, Bulletin No. 71.

in Germany. It was after the pure cultures prepared in this way were found to be unreliable in their effect that the Laboratory of Plant Physiology of the Department of Agriculture, under the direction of Dr. George T. Moore, undertook a scientific investigation of the root-nodule organism; and, as a result, it is believed that a thoroughly practical and satisfactory method of bringing about artificial inoculation has been devised.

The nature of the nodule-forming organism was very carefully investigated, and it was found to be a true micro-organism, having three well-defined stages consisting (1) of minute motile rods which produce the infection and frequently form zooglœa masses; (2) larger rods, either motile or non-motile; and (3) capsulated forms, the so-called "branched organisms," which are made up of two or more rods held together in a sheath.

Owing to the frequently observed fact that one kind of legume would not produce nodules in soil which abundantly supplied another legume with these growths, it was supposed that each legume required a special and peculiar nodule organism. Dr. Moore's experiments show, however, that there is but one species which is described as *Pseudomonas radicicola* (Beyerinck). The difference in the infective power of bacteria from different hosts is due to slight physiological variations which can be readily broken down by cultivation.

With regard to the mode of cultivation, the usual method of growing the nodule-forming organism has been to make a medium from a decoction of the particular legume upon which the organism originally grew. The number of organic and inorganic substances in both solid and liquid media upon which *Pseudomonas radicicola* will thrive is, however, very great. More than fifty different combinations, consisting of various nutrient salts, such as magnesium sulphate, potassium phosphate, ammonium phosphate, together with peptone, sugar, glycerine, asparagin, as well as potato, cabbage, &c., have been found to produce at least a fair growth, although an extract of the host plant, plus 1 to 3 per cent. peptone, with about 2 per cent. cane sugar, will give the most luxuriant growth in the shortest time. As a result of numerous trials, however, it has been found that although the bacteria increase most rapidly upon a medium rich in nitrogen, the resulting growth is usually

of very much reduced virulence, and when put into the soil these organisms are found to have lost the ability to break up into the minute forms necessary to penetrate the root hairs. They likewise lose the power of fixing atmospheric nitrogen. For this reason the mere matter of an abundant growth is one of the least desirable considerations in propagating these organisms for any practical purpose, and a medium had to be devised which, while admitting of a fair growth, would at least retain, if not increase, the ability of the organism to produce nodules and to fix nitrogen. This condition was met by using an agar, for plating out from the nodule, to which no nitrogenous salt was added, the usual combination being 1 per cent. agar, 1 per cent. maltose, .1 per cent. monobasic potassium phosphate, and ·02 per cent. of magnesium sulphate, to 100 cubic centimetres of distilled water.

Bacteria grown upon media of this character were found to be much more virulent than those cultivated on a rich nitrogenous base, and field experiments by the acre showed the greatest difference in the nodule-producing power of organisms grown by these two methods.

The influence of heat, light, alkalinity, amount of nitrogen in the soil, &c., upon the organisms is also of considerable practical importance, and for this reason a number of experiments were carried out to ascertain the effect of these external conditions, with the result that the failure of nodules to develop was often traced to these causes.

As to the precise method by which nodules are of benefit to the plant, it has been found that the bacteria are able to fix nitrogen and store it up within themselves. The young nodule is at first packed with rod-shaped bacteria and is of a pale red colour, changing to greenish gray as the nodule matures and the rods become transformed into the various irregular branched forms so characteristic of these bacteria. Finally, the cells of the roots are able to secrete an enzyme which dissolves the nodule organism when in the branched condition, and by this means renders available considerable quantities of nitrogen, which is then diffused through the plant. The bacteria, it may be noted, are almost always able to resist the action of the host plant, except when in the branched condition, although there are

a few exceptions. If the only source of nitrogen, therefore, is by dissolving the bacteria, the benefit to the plant will be little or nothing should the nodules continue to be filled with the unbranched rods, and the presence of nodules upon the roots may even be a detriment. Dr. Moore observes that too little attention has been paid to this point, and states that there is no question that frequently organisms producing nodules have lost the power of going into the branched condition, and thus while preventing their destruction by the plant, they defeat the very object for which they are supposed to be so valuable. Thus if the organisms be grown upon artificial media for a long time where they are almost invariably in the rod condition, this form becomes so firmly established that plants inoculated with such cultures, although forming nodules, receive practically no benefit, the nodules remaining firm and hard and furnishing no nitrogen to the roots. The nature of the nodule-forming organism is purely parasitic, and unless the plant can overcome its action, it causes distinct harm. It is, however, possible for the nitrogen-fixing bacteria to penetrate the roots of the plant, and, existing in the branched form, to be of decided benefit without the formation of nodules or any external evidence of their presence.

The reports received by the Department of Agriculture from practical farmers as to the value of inoculation showed the following results :—

Crops.	Total reports.	Inoculation resulting in definite increase of crop	Failures ascribed to bad season, poor seed, weeds, &c.	No increase in crop : Organisms already present.	No evident advantages: Nodules not formed.
Alfalfa (lucerne) ...	1,043	522	287	59	175
Red clover	532	302	116	84	30
Garden pea... ...	184	102	32	32	18
Common bean ...	174	85	39	23	27
Cow pea	290	148	42	68	32
Soy bean	129	54	22	11	42
Hairy vetch ...	53	28	13	3	9
Crimson clover ...	49	27	15	4	3
Field pea	22	14	4	4	—
Velvet bean ...	10	5	3	1	1
Alsike	7	3	1	2	1
Sweet pea	7	5	—	2	—
Berseem	2	1	—	—	1
Total	2,502	1,296	574	293	339

In order that the bacteria might have the most thorough practical test possible, the Department of Agriculture distributed between November, 1902, and November, 1904, about 12,500 separate packages of inoculating material. While it has been impossible to receive reports from all experimenters, the percentage of replies has been unusually large, and these are considered to be quite sufficient to enable a fair opinion to be formed as to the value of the cultures received.

The reports comprised in most cases a general statement of the results obtained, and a selection from the replies is given in the bulletin.

LIVE WEIGHT PRICES OF CATTLE IN 1904.

The returns received during the year 1904 in respect of the twenty-one places in Great Britain scheduled under the Markets and Fairs (Weighing of Cattle) Act, 1891, show that the number of cattle entering the markets at those places was 1,177,717, as compared with 1,262,301 in the previous year. There was also a reduction of 182,000 in the number of sheep; while, on the other hand, nearly 24,000 more swine were exposed.

For the first time in the history of these returns a slight check appears in the slow but steady progress of the system of weighing cattle. In 1903 the number weighed at these scheduled markets was slightly less than in the previous year, but relatively to the reduced number entering the markets the proportion was larger than in 1902. Last year, however, there was a decline both in the number and proportion of cattle weighed, which brought the figures to a position only slightly better than in 1901. Though this decline is to be regretted, it is satisfactory to know that it is due almost entirely to a diminution of 16,500 in the number of cattle returned as weighed at Shrewsbury, and that there is no evidence of any general decline in the practice of weighing, which continues on the whole to make progress, though in a varying degree, in different parts of the country.

The returns for Scotland showed, as usual, a much more extensive use of the weighbridge than is the case in England.

CATTLE, SHEEP, AND SWINE, *entering and weighed at the Markets and Marts of the undermentioned Places in the* YEAR **1904**, *as returned under the Markets and Fairs (Weighing of Cattle) Act*, 1891 (54 *and* 55 *Vict. c.* 70).

PLACES.	Cattle.			Sheep.			Swine.		
	Total Number entering the Markets or Marts.	Number Weighed.	Number Weigh'd for which Prices were given.	Total Number entering the Markets or Marts.	Number Weighed.	Number Wgh'd for which Prices were given.	Total Number entering the Markets or Marts.	Number Weighed.	Number Wgh'd for which Prices were given.
ENGLAND.	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*
Ashford ...	13,697	123	—	100,349	—	—	19,78[illegible]	—	—
Birmingham ...	16,157	—	—	45,577	—	—	262,43[illegible]	—	—
Bristol	56,117	—	—	79,337	—	—	—	—	—
Carlisle ...	64,371	10,039	10,039	247,519	—	—	14,698	—	—
Leicester ...	59,494	1,910	1,860	76,187	24	24	11,370	7	7
Leeds	34,182	3,347	3,347	116,440	1,671	1,671	4,350	35	35
Lincoln ...	9,712	16	—	64,995	—	—	18,799	343	319
Liverpool ...	49,466	8,243	8,243	349,932	2,808	2,808	144	14	14
London ...	67,125	15,339	4,527	493,610	7,553	—	1,425	—	—
Newcastle-upon-Tyne ...	96,710	3,301	3,301	332,741	—	—	47,019	1,539	1,539
Norwich ...	121,829	265	193	156,202	—	—	37,385	—	—
Salford ...	99,257	3,994	—	496,201	—	—	1,479	—	—
Shrewsbury ...	61,724	17,161	16,658	74,876	—	—	19,494	—	—
Wakefield ...	67,675	5,996	—	163,950	2,539	—	8,650	273	—
York	87,141	600	9	175,908	—	—	12,694	50	50
SCOTLAND.									
Aberdeen ...	53,916	24,695	24,695	177,827	16,094	16,008	14,256	—	—
Dundee ...	18,716	9,416	9,416	25,131	2,174	2,174	3,338	—	—
Edinburgh ...	72,078	32,836	*16,565	269,614	77	63	8,399	—	—
Falkirk ...	11,142	3,781	3,781	9,946	—	—	126	—	—
Glasgow ...	57,000	15,438	12,613	327,302	1,228	259	5,836	1	—
Perth	60,208	8,605	*4,704	257,784	1,383	*1,368	15,175	341	341
TOTAL for ENGLAND ...	904,657	70,334	48,177	2,973,824	14,595	4,503	459,723	2,261	1,964
TOTAL for SCOTLAND ...	273,060	94,771	*71,774	1,067,604	20,956	*19,872	47,130	342	341
Total ...	1,177,717	165,105	*119,951	4,041,428	35,551	*24,375	506,853	2,603	2,305

* Prices for 16,223 cattle at Edinburgh and for 3,901 cattle and 15 sheep at Perth were also returned, but without distinguishing the quality.

In spite of a considerable decline in the number of cattle returned as weighed at Perth, the total for Scotland, viz., 94,771, was larger than in the previous year, and represented 34·71 per cent. of the cattle entering the Scottish markets, as compared with only 7·77 per cent. in the case of England. At two English markets —Birmingham and Bristol—the returns fail to indicate any use of the weighbridge during the year, while at others, as will be seen from the table on page 730, it was only resorted to in a few instances.

The number of weighed cattle for which prices with quality distinguished were furnished was 119,951, as compared with 123,946 in 1903. From these recorded prices, so far as they relate to fat cattle, the average values per cwt. realised for first and second quality animals in Great Britain have been compiled for 1904, and are compared with preceding years in the following table :—

YEARS.	Prime or First Quality.		Good or Second Quality.	
	Number.	Price per Cwt.	Number.	Price per Cwt.
		s. d.		s. d.
1898	36,898	33 8	45,854	31 10
1899	43,448	35 6	37,964	33 4
1900	43,905	37 0	36,779	34 10
1901	41,126	36 0	39,903	34 2
1902	50,755	38 0	36,838	35 10
1903	46,153	36 4	40,592	34 4
1904	41,798	35 10	44,485	33 6

It will be seen that in 1904 the average price of both qualities was rather lower than in the previous year and considerably lower than in 1902, being, indeed, rather below the prices for 1901 in prime cattle and only slightly above the figures of 1899 for second quality.

Following the course of prices month by month throughout the year, it will be seen from the table given below that there was much less uniformity than in 1903. During that year there had been a regular decline from the high prices of 1902, and the comparatively low level reached at the close of the year was still

further depressed during the first three months of 1904. In the succeeding quarter, however, a sharp recovery took place, bringing prices up to exactly the same point as in August, 1902, and higher than in any month during 1903. From the middle of the year onwards there was a continuous fall until December, and the year closed with an average for first quality animals of 35s. 10d., or 8d. per cwt. higher than in 1903, and for second quality of 33s. 4d., or precisely the same as in the previous year.

Month.	Prime or First Quality.			Good or Second Quality.		
	1904.	1903.	1902.	1904.	1903.	1902.
	Per cwt. *s. d.*	Per cwt. *s. d.*	Per cwt. *s. d.*	Per cwt. *s. d.*	Per cwt. *s. d.*	Per cwt. *s. d.*
January	35 0	37 8	36 2	32 10	36 2	34 6
February... ...	34 6	37 0	36 4	32 2	35 0	34 6
March	34 4	37 0	36 4	32 0	35 4	34 6
April	34 8	37 2	37 8	32 6	35 2	35 10
May	35 6	36 8	39 8	33 4	34 6	37 4
June	38 4	36 8	42 8	36 6	34 10	40 4
July	37 10	37 0	41 4	36 0	34 10	39 8
August	37 2	36 2	38 4	34 10	34 6	36 6
September ...	36 6	35 4	37 2	34 2	33 2	34 10
October	35 8	35 0	36 6	33 8	33 0	34 4
November ...	35 4	34 10	36 6	33 2	32 8	34 10
December ...	35 10	35 2	38 0	33 4	33 4	36 0

The number of fat cattle sold at an agreed-on price per stone or per cwt. was 10,711, as compared with 11,439 in 1903. More than half these transactions were reported from Glasgow, while Liverpool, London, Dundee, and Edinburgh furnished nearly the whole of the remainder, a few instances also occurring at Newcastle, Norwich, York, Aberdeen, Falkirk, and Perth.

Store cattle, to the number of 18,480, were weighed, Shrewsbury still occupying the foremost place in transactions of this

nature, with 14,152 out of the total number. The average prices realised at that market were 34s. 6d., 32s., and 28s. 10d. for first, second, and third quality animals respectively. At

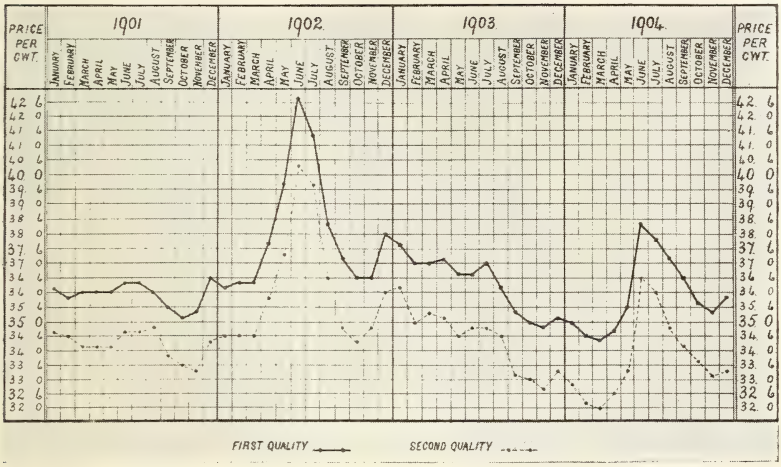


DIAGRAM SHOWING MONTHLY LIVE WEIGHT PRICES, 1901–4.

Edinburgh nearly 3,000 store cattle were weighed, and it is of interest to note that four-fifths of them were sold at an agreed-on rate per live cwt. Other markets reporting the weighing of stores during the year were Leicester, Norwich, Aberdeen, and Dundee; at all of which, except Leicester, a certain number of sales at an agreed-on rate per stone or per cwt. were recorded.

Manufacture of Alcohol from Potatoes in Germany.

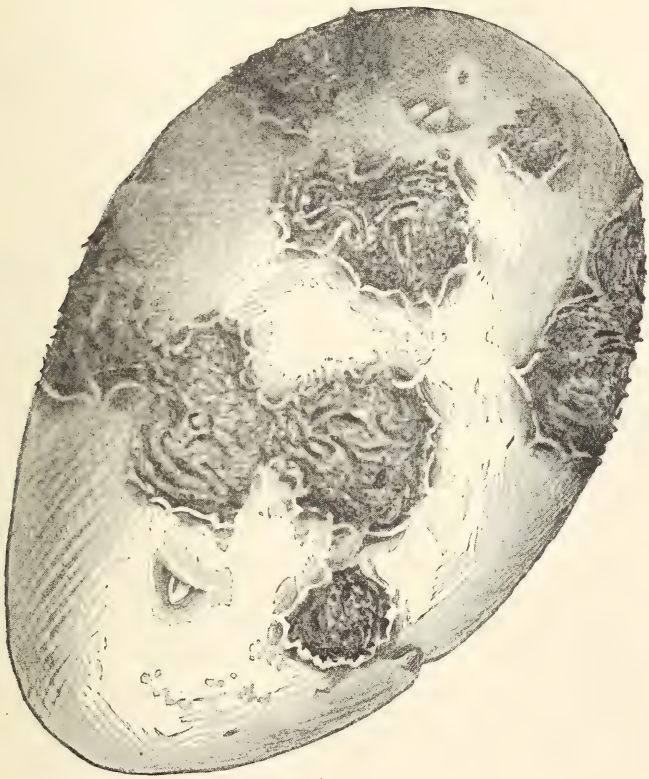
The manufacture of alcohol from potatoes is an important industry on the Continent, and more especially in Germany. The extent of the industry in the latter country was indicated in an article in a previous number of this *Journal* (April, 1904), and it appears from the official agricultural statistics that no less than 3,088,000 tons of potatoes were utilised in German distilleries for the manufacture of alcohol in the winter of 1901–2. With the object of investigating the suitability of the industry for Ireland, the Irish Department of Agriculture instructed one of

their inspectors to enquire into the methods of manufacture adopted, and his report has been published in the *Journal* of that Department for January last (Vol. V., No. 2). An account is given of the process, which consists in hydrolising the starch of potatoes (*i.e.*, changing the starch into sugar) by means of the ferment diastase contained in barley malt, fermenting the resulting mash with yeast, and distilling the alcohol from the fermented mass. With regard, however, to the suitability of this industry to Ireland, it appears from estimates of the cost of manufacture, that it could not be profitably carried on if the payment for potatoes exceeded 29s. per ton. In Germany the price paid varies according to the season and other considerations, but 20s. a ton seems to be regarded as an average value for potatoes for industrial purposes. The reason why the distillation of potato spirit pays in Germany appears to be due (1) to the favourable system of taxation adopted in the case of the "agricultural distilleries," which enables them to compete with distilleries in which cereals alone are used; (2) the payment of a bounty by the German Government on alcohol used for methylation, export, or in the manufacture of goods intended for export; (3) the heavy cost of transport of potatoes from some parts of the Empire to a large consuming centre, and the consequent low net price realised for potatoes intended for general consumption; and (4) the use of a large proportion of potato spirit, when refined and purified, as potable spirit.

Potato Scab.

At the present day Potato Scab (*Oospora scabies*) is one of the most widespread of diseases affecting the potato. The fungus usually attacks the tubers while young, forming scattered rough patches or scabs on the surface; these patches gradually increase in size and number, and not infrequently, when the tuber is full-grown, its surface is more or less completely covered with scab. The injury is confined to the surface of the tuber, the skin being broken up into fragments over the diseased patches. Although the market value is much depreciated when scab is present in quantity, the quality of the potato is not in the least impaired for eating.

If scabbed potatoes are used for "seed" without having been sterilised, the resulting crop will almost certainly be diseased, and in addition the fungus will pass into the soil, where it is capable of living for several years. Scabbed potatoes can be used for "seed" without the slightest danger of spreading the disease if they are immersed for two hours in a solution consisting of one pint of commercial formalin (=formaldehyde, 40 per cent.)



SCABBED POTATO.

mixed with thirty-six gallons of water. Afterwards the potatoes are spread out to dry, when they may be cut and planted in the usual manner. Great care must be taken after potatoes have been treated as above that they are not placed in sacks or hampers that have contained scabbed potatoes.

Land that has produced scabbed potatoes is certain to be infected with the fungus, and should not be planted with

potatoes for several years afterwards ; beet, swedes, carrots and cabbages are also attacked by the fungus. Cereals may be sown with safety on infected land. In the case of gardens and allotments, where potatoes are of necessity grown every year, the trenches in which the potatoes are planted should be sprinkled with powdered sulphur.

Lime favours the development of the fungus in the soil ; the same is true of stable manure, night-soil, &c. Acid manures should be applied to land that is infected.

Scabbed potato peelings should not be given to pigs unless they have been boiled. Burning is the safest, and in the end the most economical method of dealing with them.

Method of Judging Stock in Germany.

The German Agricultural Society have recently adopted a system of judging live stock by points at the shows held under their auspices, and in one of their publications a review is given of the systems which are in use or which have been proposed at different times, together with an account of the method which the Society, after considerable discussion, finally decided to adopt. In Saxony, for instance, a simple system of judging is in force, the points being distributed as follows :—Breeding, 3 ; head, hide, and horns, 3 ; length of back, 3 ; fore-quarters, 3 ; hind-quarters, 3 ; milking properties, 3 ; and general appearance, 6 ; and more or less similar schemes are employed in other parts of Germany, as well as in Austria, Belgium, and Switzerland. In Baden, thirteen separate points are enumerated to which marks are allotted, and the cattle must also come up to certain standards of measurement. In Wurtemberg measurements are taken for the guidance of the judge.

The method adopted by the German Agricultural Society enables the judge to mark the points of the animals according to the following scale :—Excellent, 5 ; good, 4 ; fairly good, 3 ; medium, 2 ; sufficiently satisfactory, 1 ; deficient, 0. The maximum marks to be allotted each characteristic are as follows :—

I. Breeding value:		
(*a*) Breeding, colour, and pedigree	5 × 2 =	10
(*b*) Growth or development	5 × 2 =	10
(*c*) Health and strength	5 × 2 =	10
II. Bodily structure:		
(*a*) Head and neck	5 × 1 =	5
(*b*) Body	5 × 2 =	10
(*c*) Limbs and movement	5 × 1 =	5
(*d*) Hide and hair	5 × 1 =	5
III. Useful qualities:		
(*a*) Milk production		
(*b*) Meat production		30
(*c*) Working power		
IV. General appearance	5 × 3 =	15
Total		100

The distribution of points under the third heading varies according to the qualities of different breeds; thus the red Schleswig dairy cattle are given 20 points for milk production and 10 for meat production, while Shorthorns are given 10 for milking qualities and 20 for their beef-making qualities, no marks being given in these and many other cases for working power.

It will be seen that this system of marking does not in any way diminish the need for expert knowledge and experience on the part of the judge. It indicates, however, the proportionate value or importance which he is to attach to different characteristics of the cattle brought before him, and by making each judge exactly acquainted with the views of the Society ensures a greater uniformity than might otherwise be the case.

Live Stock in British East Africa.

The upland portion of the British East African Protectorate is admirably adapted for cattle and horse breeding; there are large numbers of native cattle in the country, but the stock is weak, the beasts are small, and as milk producers they are most inefficient, the in-breeding which has gone on for generations having probably degenerated the breed. By crossing with English stock the breed might, however, become of considerable value, and it is believed that this would be attended by comparative immunity from disease. Besides the stock imported by the Government, several settlers have suc-

cessfully introduced English bulls into the country. Guernsey cattle are said to do best.

Horse and mule breeding might also be successfully undertaken by men who have capital. There are now several hundred settlers in the country, many of whom would be glad to buy riding animals, if not too expensive. The Rift Valley is said to be an ideal area for sheep farming. Both the Adminstration and a few of the settlers have successfully crossed English rams with native ewes, and Welsh sheep do well.

[*Report on East Africa Protectorate. Cd.* 2331. *Price* 5½*d.*]

Live Stock Import Regulations.—Canada.*

According to a Canadian Order in Council of March 30th, 1904, the following are the regulations relating to the importation of live stock into Canada from countries other than Mexico and the United States. Persons contemplating the importation of animals must first obtain from the Canadian Minister of Agriculture a permit stating the number and kind of animals to be imported, the country of origin and probable date of shipment, the port at which the animals are to be landed, and the approximate date of their arrival. This permit will not be available at any port other than the one for which it is issued. Animals arriving at any port in Canada without such permit will not be admitted into Canada unless ordered by the Minister. The importation of animals is prohibited except at the ports of Victoria, Vancouver, Quebec, Halifax, St. John, N.B., Charlottetown, P.E.I., and such other ports as may hereafter be indicated.

All importers must certify under oath, before making Customs entry, the place of origin of the animals imported by them, and the animals must be inspected on arrival by inspectors appointed for the purpose.

A quarantine of sixty days will be enforced on all cattle imported from Great Britain, Ireland, or the Channel Islands, and of ninety days in the case of cattle from other countries, to be counted from the date of clearance of the vessel. All importers, or their agents, before embarking animals, other than

* Live stock import regulations have been published in this *Journal* for the following countries:—United States, Vol. X., No. 1, June, 1903, and Vol. XI., No. 7, Oct., 1904; Argentina, Vol. XI., No. 10, Jan., 1905; and Cape Colony, Vol. XI., No. 11, Feb., 1905.

horses, for Canada, must obtain a certificate from a properly constituted authority that the place from which such animals come is free from contagious pleuro-pneumonia, rinderpest, or foot-and-mouth disease.

A quarantine of fifteen days, to be reckoned from the day of landing, is required in the case of sheep and goats, and a similar period in the case of swine imported for immediate slaughter.

Horses consigned to Montreal must, if the Minister so directs, be inspected at Quebec during summer navigation ; but in the absence of special directions they may be inspected at Montreal. Horses landing at any of the other ports named shall be inspected at such ports. All horses must be accompanied by the certificate of a qualified veterinarian and of the local authority of the district whence they came, stating that no glanders, "*maladie du coit*," or other serious infectious or contagious disease has existed in the said district for a period of six months prior to their shipment.

Quarantine Regulations.—Cattle six months old or over will not be discharged from quarantine until they have been submitted to the tuberculin test. Cattle reacting, but not showing clinical symptoms, will be permanently marked in the right ear with the letter "T" by the officer making the test, and may then be released at the expiration of the prescribed period of quarantine if found free from all other infectious or contagious diseases. Cattle which show clinical symptoms of tuberculosis are to be destroyed or otherwise disposed of as the Minister may direct ; and the destruction may be authorised of any quarantined animals.

The expense of feeding, treating, and providing for animals detained in quarantine must be borne by the owner or importer, and such expenses must be paid before the animals leave the quarantine station.

Use of Dried Sugar Beet for Fodder.

Attempts have been made in France and Germany during the last few years, with apparent success, to employ sugar beet in a desiccated form for feeding stock. In its natural state, difficulties of transport and preservation have usually prevented the extended use of this root for feeding, except on the farm, while the large proportion of water makes

it suitable only for ruminating animals. The extraction of the bulk of the water from the root, whilst leaving the nutritive properties unimpaired, yields a product which is easy of transport and capable of indefinite preservation. In addition, it has the great advantage of forming an excellent food for horses. The treatment of beet in this manner forms the subject of a note* by Professors Muntz and Girard, of the French *Institut Agronomique*, and they state that it is now practised industrially in France and Germany.

Several of the methods employed for the desiccation of residues are equally applicable to the drying of beet, though the latter should not be exposed to over high temperatures, as it is likely to diminish the digestibility and possibly to modify the appearance and taste of the product. The beet, after being cut up, should be dried till it contains only 12 or 13 per cent. of water; it is then crisp, and breaks easily between the teeth, and animals eat it readily. It is important that the evaporation should be pushed far enough, both for the preservation of the product and in order to make it appetising. When 16 to 18 per cent. of water is left the cakes or pieces are soft and elastic and stick together, and horses eat it less willingly. In the case of cattle it is not of so much consequence, as it can be given to them after being wetted with warm water. It will keep for long periods without going mouldy.

About 435 lb. of roots are required to produce 100 lb. of dry beet containing 13 per cent. of water, and assuming the raw beet to contain 15 per cent. of sugar, the dried article would contain about 63 lb. of sugar per 100 lb. The analyses of two samples were as follows:—

	I. Per cent.	II. Per cent.
Water	14·50	10·00
Albuminoids	6·19	6·07
Saccharose	54·20	58·06
Glucose	2·70	2·42
Cellulose	4·20	4·14
Mineral matter	4·80	4·64
Other "	13·41	14·67
	100·00	100·00

Assuming sugar beet to be worth about 20s. per ton, the raw

* *Annales de l'Institut National Agronomique*, 1904, Vol. III., Part II.

material per 100 lb. of dried product would cost about 4s., and the cost of manufacture is estimated at about 1s. 6d.

MM. Muntz and Girard conducted an experiment with a view of testing its suitability for horses in active work. Eight horses belonging to the Paris Omnibus Company were selected, four of which were fed on their usual rations, viz., $19\frac{3}{4}$ lb. daily of maize, oats, and beans, mixed with 9 lb. of chaff; four others received during the first week $17\frac{1}{2}$ lb. of mixed grain, 2 lb. dried beet, and $\frac{1}{4}$ lb. of beans, with 9 lb. of chaff. In the second and third weeks the quantity of dried beet was increased by 2 lb. each week in substitution for an equal amount of grain. During a period of twenty-one days the four horses on the ordinary ration showed a loss in weight of 21 lb. each, while the four receiving dried beet gained 9 lb. each. In the fourth week the beet was increased to 8 lb. with 11 lb. of grain, and nearly 1 lb. of beans, when the horses showed a further gain of $4\frac{1}{2}$ lb. each, and although the proportion of sugar was larger than can usually be fed with advantage, it did not appear that, given in this form, it exercised any unfavourable result on the health of the animals.

Mange in Cattle.

Mange in cattle is a contagious skin disease caused by parasites belonging to the class of *Psoric acari*. Three forms of mange occur in cattle, viz., Sarcoptic, Psoroptic, and Symbiotic. These forms are named after the variety of parasite which is the causal agent. Sarcoptic mange in cattle is uncommon, the most prevalent forms being the psoroptic and symbiotic, and these frequently exist together in the same animal. Cows are most often attacked.

Symptoms.—The most common sites of mange are the root of the tail and the neck, especially the former. The psoroptic form may spread all over the body if treatment is neglected, but this is unusual. The biting of the parasites gives rise to an itchy condition of the skin which causes the animal to rub itself against fixed objects, with the result that the hair over the affected part gets rubbed off. On examining the skin a considerable amount of scurf may be seen; red and yellow blood scabs occur on the surface, and there may even be abrasions if the animal has been rubbing against rough objects.

If the psoroptic form should spread over the body, the patient may waste away and become greatly reduced in condition. In cases of this kind, however, it will often be found that the wasting is due to some serious internal trouble such as tuberculosis, which reduces the animal's natural power of resistance to the less serious disease.

It has not infrequently been observed that cows appear to become cured spontaneously when turned out to grass in the spring. This usually means, however, that under open-air conditions the parasites do not increase at the same rate, hence the active symptoms are merely less marked. In the autumn, when the animals are again stabled, the acari (parasites) which have persisted resume their activity, and this may lead to the erroneous belief that re-infection has taken place.

Prevention.—The affected patches on the animal's skin should be softened by washing with soap and warm water. After this has been done, the parts should be dressed with one of the common mange dressings, such as spirit of tar, oil, and sulphur. The dressings should be applied twice or even three times at intervals of ten days. For the serious and rebellious cases above mentioned veterinary advice should be sought.

The litter from an infected animal should be removed each time after dressing, and the flooring and wood or other fittings should be well sprayed with a 5 per cent. solution of carbolic acid in water.

Approval of Sheep-Dips.

Under the Sheep Scab Orders made on January 27th last by the Board of Agriculture and Fisheries the use of sheep-dips approved by the Board is required.

The Sheep Scab Order for 1905 contains three prescriptions* for dips which have been approved after experimental trials. The Board are prepared to receive applications from manufacturers of any sheep dip for their approval of its use for sheep scab, and have arranged that any analytical examination necessary to verify the stated composition of the dips submitted to them shall be made at the Government Laboratory.

Forms of application for the approval of a dip may be

* *Journal*, Vol. XI., No. 11, Feb., 1905, p. 662.

obtained from *The Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W.*

Tests for Farmers' Milk.

It is a well-known fact that in the vast majority of cases the milk given by the cows in this country exceeds in butter-fat and other milk solids the percentage specified in the "Sale of Milk Regulations, 1901," made by the Board of Agriculture. It happens, however, occasionally, that for one reason or another a cow may give milk which does not contain those percentages (3 per cent. of butter-fat and 8·5 per cent. of other milk solids); and in such cases the dairyman, when prosecuted, is required to prove that the milk is genuine. In order to avoid the trouble and annoyance of a prosecution, farmers, dairymen, and all other cow-keepers are strongly recommended to have samples of the milk of their cows tested from time to time. By this means they will be able to watch the seasonal and other variations in the fat contents of the milk, and by modifications in the feeding, housing, or time of milking of their cows, and, if necessary, by disposing of animals that give milk of low quality, to keep the quality of their milk at a satisfactory level.

The Board of Agriculture and Fisheries have ascertained that, with the object of assisting farmers in the direction indicated, most of the Agricultural Colleges and Agricultural Departments of the Universities have made arrangements for determining the percentage of butter-fat for a fee of sixpence per sample. A list of these institutions is given below.

It must, however, be understood that:—

1. The report sent will only refer to the percentage of butter-fat.

2. Each report refers only to the sample tested, and implies no guarantee whatever as to the bulk.

3. Each report is supplied only for the information of the milk producer, and must not be used as evidence in case of any dispute between seller and buyer, or where the quality has been questioned by any public authority.

The directions issued by the institutions must be carefully observed. They require, as a rule, that:—

1. The fee of sixpence should be sent with the sample. In the case of Essex, however, the fee charged by the county is one shilling; while no charge is made by the West of Scotland

Agricultural College to farmers residing in the counties contributing to the support of that body.

2. A stamped and addressed envelope should be sent for the report.

3. Samples should not be sent so as to arrive between Friday night and Monday morning.

4. If it is proposed to send samples periodically, as may be in many cases advisable, the institution should be so informed.

5. The sample bottles should be carefully sealed and packed in accordance with the requirements of the General Post Office, and the postage prepaid.

6. The following instructions as to taking samples should be closely followed.

Instructions for taking samples :—

A. Testing the Milk of One Cow.—The sample should be taken immediately after the cow has been milked. To ensure thorough mixing the milk should be poured from one vessel into another several times, and a small quantity then quickly removed and at once transferred to a clean bottle, capable of containing at least a quarter of a pint. The bottle should at once be corked and sealed.

B. Testing Mixed Milk.—In taking a sample from the milk of a herd it is often impracticable to mix the milk by pouring it from vessel to vessel. The sampling may then be done by using a strong glass tube, obtainable from any chemist, of about three-eighth inch bore and open at both ends. The tube must be sufficiently long to reach the bottom of the can, and should be slowly passed perpendicularly into the can until it touches the bottom. If this is done carefully it will then be found that the milk in the tube stands at the same level as the milk outside. The *upper* end of the tube should then be firmly closed with the thumb, when, if the tube is carefully withdrawn, the column of milk will remain in the tube, and may be emptied into a clean bottle by gently releasing the thumb so as to admit air. Samples taken in this way from all the pails should be thoroughly mixed in the same way as the sample of a single cow.

If a glass tube is not procurable, the milk must be mixed thoroughly by pouring from vessel to vessel. Stirring the milk is not enough.

The bottle in which the milk is sent should be full, and a label should be affixed to it, stating the name of the sender, full postal address, and the date on which the sample was taken.

The following table shows the counties with which each institution is associated, and milk producers should be careful to address their samples to the address given opposite the county in which they are situated :—

Mid-Lothian, East and West Lothian, Berwick, Clackmannan, Fife, Forfar, Kinross, Peebles, Perth, Roxburgh, and Selkirk.	A. Lauder, Esq., B.Sc., East of Scotland College of Agriculture, 13, George Square, Edinburgh.
Argyle, Ayr, Bute and Arran, Dunbarton, Dumfries, Kirkcudbright, Lanark, Perthshire (western district), Renfrew, Stirling, and Wigtown.	R. Patrick Wright, Esq., West of Scotland Agricultural College, 6, Blythswood Square, Glasgow.
Northumberland and Durham.	The Agricultural Chemist, Armstrong College, Newcastle-on-Tyne (in Term time only).
Cumberland and Westmorland.	W. T. Lawrence, Esq., Newton Rigg, Penrith.
Yorkshire.	Dr. Crowther, The University, Leeds.
Lancashire.	The Director, County Farm, Hutton, near Preston.
Cheshire.	T. J. Young, Esq., F.S.I., Agricultural College, Holmes Chapel, Cheshire.
Derbyshire, Notts, Leicestershire, and Lincolnshire (parts of Lindsey).	John Golding, Esq., F.I.C., F.C.S., The Chemical Department, Midland Agricultural and Dairy Institute, Kingston, near Derby.
Stafford and Salop.	P. H. Foulkes, Esq., Harper Adams Agricultural College, Newport, Salop.
Norfolk,* Suffolk,* Cambs, North Hants, Hunts, Bedford, Herts, Essex,* and Isle of Ely.	T. B. Wood, Esq., Department of Agriculture, Cambridge (in Term time only).
Norfolk and Suffolk.	J. A. Smith, Esq., Eastern Counties' Dairy Institute, Ipswich.
Essex.	G. Clark, Esq., The County Technical Laboratories, Chelmsford (the fee in this case is 1s.).
Kent and Surrey.	The Principal, South Eastern Agricultural College, Wye.
East Sussex.	S. Woodhead, Esq., Agricultural College, Uckfield.
Oxford, Bucks, Berks, and Dorset.	J. Percival, Esq., University College, Reading.
Anglesey, Carnarvon, Flint, Denbigh, and part of Montgomery.	Prof. Winter, University College of North Wales, Bangor.
Brecon, Cardigan, Carmarthen, Merioneth, part of Mongomery, Pembroke, and Radnor.	J. Alan Murray, Esq., University College of Wales, Aberystwyth.

* As an alternative, samples from these counties can be sent to the Institutions shown separately.

In the case of many of the colleges, advice as to the course to be adopted to secure a better quality of milk will be sent—if a form which is supplied by the college is filled up, giving certain information respecting the conditions under which the cows are kept.

Export of Fowls from Australia.

The Department of Agriculture for Queensland proposes to initiate the business of exporting fowls to the British market by undertaking to receive live birds of a certain age and weight, to prepare them at owners' expense for export, and to consign them to the home market. It is expected that some 500 chickens and turkeys will be dealt with in 1905. All charges for receiving, killing, freezing, packing, freight, &c., will be charged against the proceeds.

Chickens must be from four to five months old, and weigh from $3\frac{1}{2}$ to 5 lb. live weight; ducklings must be from ten to twelve weeks old, and weigh not less than $3\frac{1}{2}$ lb. live weight; and turkeys must be not more than ten months, and weigh not less than 13 lb. live weight in the case of gobblers, and 9 lb. live weight in the case of hens. The Department will not purchase the poultry, but merely assist breeders to dispose of the birds to the best advantage.

A similar depôt is also about to be established by the Department of Agriculture, Tasmania, to which farmers may consign poultry suitable for export. The birds may be killed, plucked, graded and packed at the depôt, and will be marked with the Government brand and graded either 1st or 2nd class.

In New South Wales also an export poultry depôt is in existence, where fowls, ducklings, goslings, and turkeys are received and prepared for export. The Department provides cases, freezes and ships the birds at a fixed charge of 6d. a pair for fowls and ducklings, and 1s. per pair for geese and turkeys. This covers all expenses free on board ship, except railway freight.

Experimental Orchards

In several European countries and in the Colonies orchards have been established either by the State or by local authorities for the purpose of illustrating by practical example the most approved methods of planting and treatment of fruit trees, and frequently with a view also to testing the suitability of different varieties to local peculiarities of soil and climate. An account of the steps taken in this direction in Hungary was given in this *Journal* for March, 1904 (Vol. X., No. 4). In that country, State seedling farms and model orchards have been established to provide seedlings and grafting stems, whilst what are called parochial orchards are planted along the roads and highways.

In France a proposal to establish five model orchards in the Department of Finistère has recently been approved on the lines laid down in a Report by M. Soulière, the Departmental Professor of Agriculture. The objects which such experimental orchards are intended to serve include the testing of the best varieties of fruit trees for grafting, the investigation of the best local varieties as well as varieties grown elsewhere, and the practical illustration of rational methods of planting, grafting, training and cultivation of fruit trees.

In order to avoid the expense of purchasing or renting land, it is proposed to arrange with landowners for the use of the necessary area on the condition that all expenses of planting, cultivation, manuring, pruning, &c., be borne by the local authorities, the fruit produced to belong to the proprietor and to be gathered at his expense. It is estimated that by this means an orchard of about 2½ acres could be planted with about 100 trees for the sum of £18, whilst the expense in subsequent years would be materially less.

In the Province of Ontario eleven fruit experiment stations and two sub-stations have been established on somewhat similar lines. Instead of buying land, erecting buildings, and appointing employés in different localities, reliable fruit-growers have been selected who possessed good orchards or plantations at various places, covering fairly well the different soils and climatic conditions of the province. These growers were asked to plant, take care of, and report upon the varieties of fruit trees supplied to them ; they received a grant of from £30 to £35 a year, and

the varieties supplied became their property. These stations are inspected and reported upon annually. In this way valuable information has been obtained as to the merits of different varieties of fruit, the soils to which they are adapted, and the climatic conditions under which they may be expected to thrive. Model orchards have also been established in Quebec, the trees being supplied by the Department of Agriculture to farmers in certain localities, who undertake to plant and manage them according to the directions of the Department.

The Bulb Mite (*Rhizoglyphus echinopus*).

Rhizoglyphus is a genus of Mites belonging to the family *Tyroglyphidæ*, a family with a comparatively small number of genera and species, but a great number of individuals, masses of which may be found together. Familiar examples of the family are the cheese mites, the hay mites, and a species which has several times been found swarming over furniture, curtains, &c., in houses. The family is interesting biologically, as amongst its members we get, in addition to the stages in the life-history of mites in general, the hypopus stage, this being a stage developed for the purpose of the spread of the species. Besides other differences, it is characteristic of the hypopus that it possesses suckers by which it can adhere to flying or passing animals, and thus be conveyed to fresh feeding grounds. In this stage the mite is able to resist conditions which would be fatal to it in its other stages. All the individuals of the same generation do not pass through this hypopial stage.

There are two British species of Rhizoglyphus, viz., the Bulb Mite (*R. echinopus*) and *R. agilis*. The latter, discovered by Michael on decaying cabbage stalks in the South of England, is narrower in body, lighter in colour, and more active in habit than the Bulb Mite.

Food Plants of the Bulb Mite.—Rhizoglyphus (root eater) *echinopus* (spiny legs) feeds on underground swollen stems and roots, *e.g.*, the bulbs of the tulip, lily, hyacinth, onion, eucharis, and the tubers of the potato and dahlia ; it has also been taken in destructive numbers on the roots of the vine. This mite has been distributed all over the world in its food plants. Signs of

infestation by the mite are :—Checking of the plants, the leaves turning yellow ; failure to produce flowers ; and reddish-brown spots on the scales of the bulb, indicating feeding places of the pest. There has been some controversy as to whether the mites are really the cause of the failure of the bulbs. Some maintain that the decay of the bulb is due to error in treatment, *e.g.*, in eucharis bulbs to over-forcing, or bad drainage, or faults in

FIG. 1.
Adult Male, magnified 95 times.

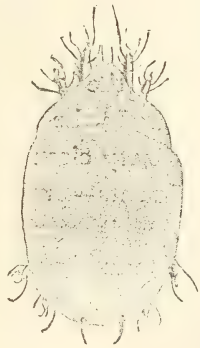


FIG. 2.

Hypopus, magnified 100 times.

(Both figures after A. D. Michael).

temperature or moisture, or shade, and that the decaying bulbs are then attacked by the mites. Michael, however, in many experiments, has placed it beyond question that the mites attack and, indeed prefer, sound bulbs, and the mites have been found at their destructive work in otherwise good tulip bulbs.

Description.—R. echinopus can be found in the stages of egg, larva, nymph, hypopus, adult males of two forms, and female. The adults have a smooth body, yellowish white in colour, tinged with pink. The legs and rostrum are red. Each mandible ends in a pair of pincers, the branches of the pincers having three teeth. Just behind the second pair of legs on each side of the body is a projecting hair. There are four pairs of short thick legs, the two front pairs being the strongest; the legs

are five-jointed, bearing spines and hairs, and ending each in a single claw. The male has the abdomen more rounded at the end than the female ; the hind part of the cephalo-thorax in the male is as wide as the abdomen ; in the female it is not quite so wide. In one of the two forms of male the third leg on each side is thicker, and is not used in locomotion. The hypopus carries on the middle of the under surface of the hind region a horny plate with twelve suckers ; in front of this plate are two additional suckers.

The mites are extremely minute—it may be less than one-twentieth of an inch—and need for their examination a good lens or microscope.

Life-History.—From the eggs hatch out six-legged larvæ. After feeding for a short time the larva becomes inert and moults ; the new form has eight legs, and is known as a nymph. In the nymph stage the greatest growth takes place. In ordinary circumstances the nymph—according to Michael's experiments—probably moults twice, each moult being preceded by a sluggish period ; the last moult of the nymph is succeeded by the sexually mature adult. Where, in the life-history of the individual, a hypopial stage appears, the number of moults is greater than the above. Larva, nymph, and adult do not greatly differ from one another in external appearance.

Treatment.—1. This pest is very difficult to combat because the extremely tiny mites feed not only on the outside of the bulbs but they exist between the leaf scales of the bulb, feeding and laying their eggs in the interior, where they can scarcely be reached. The best plan is to burn infested bulbs, and the soil, whence these have been removed, should be disinfected.

2. Wash or spray the bulb with paraffin, the treatment being repeated a fortnight later.

3. Washing the bulbs in sulphide of potassium (liver of sulphur), 1 oz. to 3 gallons of water, or brushing with this after removal of the outside loose scale leaves. This treatment is useful against fungi which follow the attack of the mite.

4. Fumigating with bisulphide of carbon. The bulbs to be treated should be placed in an air-tight receptacle, and a saucer, into which bisulphide of carbon has been poured, placed on the top of them. The bulbs should be left in the vapour for forty-

eight hours. This treatment could be usefully extended to imported bulbs, which ought to be examined for the mite. The formula for fumigation on this larger scale is one pint of bisulphide of carbon to 1,000 cubic feet of space. Bisulphide of carbon fumes are very poisonous, and should not be breathed, and no naked light (the operator, for example, should not be smoking) must be brought near them.

R. STEWART MACDOUGALL.

Forestry Education.

An account of the position of forestry education in Great Britain was given in this *Journal* for April, 1904, and it was stated that the Treasury had made a grant for that purpose of £500, which the Board had determined to divide equally between the Agricultural Departments of the University College of North Wales, Bangor, and of the Durham College of Science, Newcastle-on-Tyne.

The University College of North Wales has appointed as Lecturer in Forestry, Mr. Fraser Story, formerly Lecturer in Forestry at the Edinburgh and East of Scotland Technical College, and Examiner in Forestry to the University of Edinburgh. Two courses of lectures have been arranged, (1) a short course of 20 lectures for students for the Agricultural Diploma, and (2) a course of 90 lectures for Certificates in Forestry. The plantations of the Liverpool Corporation at Vyrnwy are available for demonstration purposes, as well as the plantations on the College Farm and elsewhere. The College is also in a position, through the appointment of Mr. Story, to offer to owners of woods skilled advice on all matters relating to the foundation, regeneration, tending and management of woodlands.

The Durham College of Science has appointed Mr. A. C. Forbes, F.H.A.S., as Lecturer in Forestry, and for the purpose of practical work the experimental plantations and the tree nurseries at Cockle Park are available, while various neighbouring landowners have placed representative and appropriate woodlands at the disposal of the College for demonstrations to students.

The Council of the Surveyors' Institute have approved a

proposal for the establishment of Scholarships in Forestry at Bangor and Newcastle to be offered to Students, Associates or Fellows of the Surveyors' Institution. It is also proposed to offer a Scholarship at Cambridge. The details of the scheme are now under consideration.

The steps taken by the Commissioners of Woods and Forests with regard to the small school of forestry for woodmen in the Forest of Dean, were referred to in the previous note on this subject. This school was started in January, 1904, with nine student workmen, of whom seven were already in the employment of the Crown in the forest and two came from Windsor. These young men are paid for their work, receive practical instruction in the woods, and attend lectures in a class-room provided in the Crown Office at Coleford.

With a view to making the Alice Holt forest available as a demonstration area for the practical study of forestry, the Commissioners have obtained from Dr. Schlich, C.I.E., an exhaustive report on the condition of each of the woods comprised in this forest. In this report, Dr. Schlich expresses his general approval of the operations recently carried out, and develops in detail a working plan for their continuance in the future. This scheme will be followed as far as possible, but the difficulty in getting the required amount of labour just at the right time of year for wood cutting in this district may for some time to come restrict the extent of the operations as laid down in the scheme, and the fall in the price of bark, and the increase in the cost of labour and of rates may, it is stated, considerably interfere with the estimated net receipts.

Forestry in Finland.

The forests in Finland, although still numerous, are in several districts, particularly in the southern parts, almost entirely cut down, owing to the good prices offered for timber of small dimensions, particularly props and so-called paper-wood. This tempted many owners to do away with the last of their forests, and now they have scarcely sufficient left for their own use or for building purposes. The buying up of large estates by the saw mill owners has also caused the land thus acquired to be

left almost untilled, and in a few years many now good estates will be sadly deteriorated. It is generally only wealthy companies who are in a position to buy up huge areas of land and to introduce a rational management of their forests, felling only certain trees for the saw mills, carefully protecting the young growth, and leaving, at suitable places, full-grown trees for seed.

In 1903 the timber market was relatively firm, in consequence of a reduction in produce by the saw mill proprietors in Scandinavia during the two preceding winters. Comparatively good prices were obtained, and the year may be considered a prosperous one. Yet the exportation of props, which has now assumed exceptionally large proportions, having more than doubled in the last few years, causes much anxiety. It has risen from £156,000 to £368,000 in 1903.

The export during 1902 and 1903 has been as follows :—

	1903 Standards.	1902 Standards.
Masts, logs, &c.	53,640 ...	30,630
Props	264,655 ...	114,520
Pulp and paper-wood	104,200 ...	72,134
Square timber and sleepers...	38,300 ...	24,800
Firewood and laths	234,000 ...	218,500
Deals, battens and boards	517,000 ...	510,000
Deal-ends and staves	57,150 ...	47,800

It has long been known that Lapland possesses great wealth in its immense forests. They have stood untouched for centuries, and up to the present without any careful supervision, but, at the same time, free from the woodcutter's axe. In this country there was only one forest inspector and a few foresters, whose duty it was merely to prevent the illegal felling of trees and to protect them against fire. On account of their remoteness and the want of suitable rivers to float the timber southwards these valuable forests have remained undisturbed.

It has now been decided to commence a rational exploitation of these vast forests, containing about 10,000,000 of large trees. On account of the slow growth in this northerly region, an average age for full-grown trees has been calculated at 250 years, with an average height of 17 metres (about 56 English feet). About 100,000 trees are now to be sold by public auction as a trial, and the timber will have to be floated through the Patsjoki Lake, on the Finnish frontier, to Varanger Fjord in Norway.

It can also be floated through several Finnish lakes and rivers to the Murman coast on Russian territory. This experiment by the Finnish Government to open the forests in the "High North" will certainly be of great interest to saw mill owners. Swedish and Norwegian companies are already making inquiries with regard to the time of sale, yet it is improbable that Finnish speculators will avail themselves of this fact, as no Finnish firm at present carries on any timber export from the Arctic Sea, though Swedish, Norwegian and Russian exporters have great experience in floating and exporting timber from that northerly region.

At a meeting of saw mill owners in 1903 the chairman stated that he had received accounts from 86 mills, with a production of over 300,000 standards. The quantity remaining unshipped, although sold, was 90,579 standards, against 91,331 standards in 1902.

At the meeting in 1902 it was agreed that less timber should be felled, but it is feared that this agreement has not been strictly followed by some companies. This has caused some discontent amongst the Swedish producers, but for next winter they have made a binding agreement for a further reduction of 10 per cent. in the number of trees to be felled.

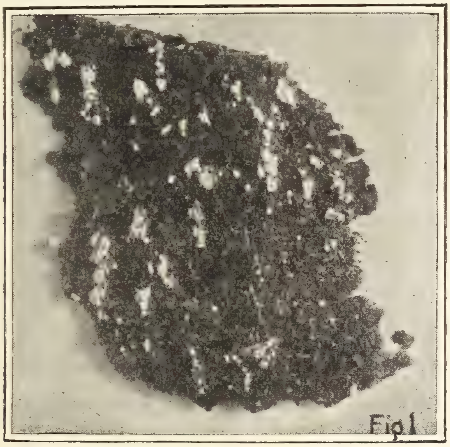
At this meeting the props and paper-wood question was also discussed. The opinion is general that all export duty on forest products should be abolished, but, if that be impossible, that the duty on props and paper-wood should be the same as for larger timber and sawn goods. The felling of the small kind of timber threatens to destroy forests and to be a great national loss, and it is feared that this destruction will go on for years, because Austria-Hungary, by putting a high duty on these articles, has compelled the Germans to fill their requirements of pulp and paper-wood from the northern countries.

The export of props and paper-wood to Belgium and France makes it impossible for the Finnish paper industry to export paper to those countries, as they import the raw material duty free, but charge duty on the finished article when imported.

[*Foreign Office Report, Annual Series, No.* 3,278.]

The Felted Beech Coccus.

This insect (*Cryptococcus fagi*, Bäerensprung) confines its attacks exclusively to the beech (*Fagus sylvatica*), and is one of the most destructive pests against which the arboriculturist has to contend. It is widely distributed throughout England, and has occurred in many parts of Scotland. It is common in the counties of Flint and Denbigh in North Wales; while in Ireland it has, so far, been recorded from one locality only. Its attacks are often restricted to a comparatively small area, or even to single isolated trees, this being especially noticeable where the tree-trunks are sheltered from the prevailing winds.



[FIG. 1.—FELTED BEECH COCCUS ON FRAGMENT OF BEECH BARK (natural size).

In some localities it is almost entirely absent, as, for instance, in the large beech woods on the Witcombe Estate in Gloucestershire. It has, however, done a considerable amount of damage to trees in the district of Newcastle-on-Tyne; and to the magnificent beech trees in the eastern districts of Surrey, where many of the finest trees have been destroyed; and has caused extensive injury in the Maidenhead district. At Hexham it was found upon beech trees from 150 to 200 years old, and was first noticed upon them eight or ten years ago when they looked perfectly healthy; since then the insect has made steady progress, and the trees named above were in 1901 nearly dead. From Hertfordshire comes the report that it is spreading rapidly, and causing the death of the trees. It is prevalent throughout the

county of Cheshire, and has proved a troublesome and destructive pest.

Its distribution outside the British Isles has not been very generally observed, but it is common in some parts of Germany, and has been met with plentifully in Bohemia.

Owing to the whiteness of the felted covering with which the female protects its body, and also to its exposed position upon the trunks and main branches of the trees, it is at all times a conspicuous species, and more especially so when the white secretionary coverings unite and form one homogeneous mass, thereby almost completely covering the bark of the tree.

Young and old trees are alike attacked; and the insects usually confine themselves to the main trunk and larger branches; but the smaller branches, especially those of young trees, are sometimes infected to a serious extent. Where the infected trees are growing in exposed situations the insects almost invariably select the sheltered side of the tree. Many badly infected trees which have been under close observation for the last sixteen years are still apparently vigorous and healthy, while others have been totally destroyed. The first sign of decay is usually seen in the foliage, which becomes discoloured and sparse or thin, accompanied by the death of the smaller branches; this is followed by the death of the larger branches and, finally, the tree trunk; while the bark peels off from the branches (Fig. 5) and falls away. Whether the work of destruction is aided by the joint action of a bacterial or fungoid disease is not at present known, but it is probable that such is the case, otherwise it is difficult to understand how it is that so many badly infected trees withstand the attacks of the insects for such long periods, as they undoubtedly do, without showing any evident signs of decay.

Description and Life-History.—The beech coccus belongs to the generally destructive family of Scale insects (COCCIDÆ). The adult female (Fig. 2) is of a lemon-yellow colour, and measures about one twenty-fifth part of an inch in length. It is both wingless and legless; is somewhat hemispherical in shape, being flattish beneath and highly convex above; to the naked eye or under low magnifying power it appears like a small yellow egg. The mouth organs are placed on the underside of the body, and are composed chiefly of three hair-like appendages which

in life are united together and form a long sucking tube; with this slender apparatus the insect pierces the bark and sucks up the juices of the tree. She has no power of locomotion and remains stationary during the whole of her life, anchored to the tree by her mouth organs as a fixed inert mass of animal matter, motionless and apparently senseless. Almost immediately after leaving the egg she covers her body with the white felted secretion composed of fine filaments of wax which thickens as she advances to maturity, forming an excellent protection to her body, and is practically impervious to rain. Within this covering (see Fig. 1) the insect lives, lays her eggs, and dies. The larvæ, or "lice" as they are sometimes called,

FIG. 2*b*.

FIG. 2.

FIG. 2*a*.

FIG. 2.—FEMALE BEECH COCCUS (divested of the white covering) in the act of extruding an egg, underside showing hair-like sucking mouth (magnified 40 times). 2*a*. Rudimentary antenna. 2*b*. One of the two rudimentary legs. (Both magnified about 600 times.)

are very tiny active creatures, and are scarcely visible to the naked eye. They possess three pairs of legs and a pair of horns (antennæ), and like their parents are of a yellow colour. Although they can and do travel over the bark of the tree, they are by no means of a wandering disposition, and usually settle down in the immediate neighbourhood of the parent, the majority working their way under the bodies of their dying or dead parents, taking up their positions, by preference, in the deepest parts of the fissures in the bark, where they remain for the rest of their lives pumping up the juices of the tree. Each individual protects its body with secretion, which adds to that already secreted above them by the insects of the previous generations; thus the secretion gradually thickens and spreads over the tree-trunk, forming a more or less continuous mass, often attaining a considerable thickness. Those larvæ which wander over the bark are liable to be borne away by the wind

or, inadvertently, by birds and insects, and this is undoubtedly the means by which fresh colonies are started.

The male is unknown in any stage, the females being parthenogenitic, and can evidently reproduce their species without the intervention of the opposite sex.

Many of our indigenous Scale insects are subject to the attacks of minute parasitic insects related to the wasp family; but, so far, the beech coccus has proved immune from their attacks. Birds, moreover, do not appear to feed upon them.

TREATMENT.

Owing to the comparatively smooth nature of the bark of the beech, and also to the fact that the insects are often confined to the trunk and main branches, this pest is thereby rendered more easily accessible for treatment with insecticides than are many other pests. But they are so well protected by their waxy coverings that the application of an insecticide must be carried out in a thorough manner or the result will be anything but satisfactory. The three formulas given below have proved to be thoroughly efficient in destroying this pest, and if applied according to the instructions will be found to give highly satisfactory results:—

1. *Paraffin Emulsion.*—This should be prepared in the following way:—Mix equal proportions of soft soap, dissolved in boiling water, and paraffin, and then churn them up by means of a force-pump or syringe. When required for use add twenty times its bulk of water and again churn with a force-pump or syringe.

2. *Paraffin Emulsion with Sulphur and Turpentine added.**—Take about half a gallon of soft water, boil and dissolve about 1 lb. of common soap, add a handful of sulphur and a pint of paraffin, and about the same quantity of turpentine. Then add about four gallons of soft water to this mixture. Churn well together, as recommended in the previous formula.

3. *Caustic Alkali Wash.*†—Dissolve 1 lb. of commercial caustic soda in water, then 1 lb. of crude potash or pearl ash in water. When both have been dissolved mix the two well

* Gillander's Mixture: Trans. Manchester Microscopical Soc., 1898. Separate reprint, p. 12.

† See also Leaflet No. 70.

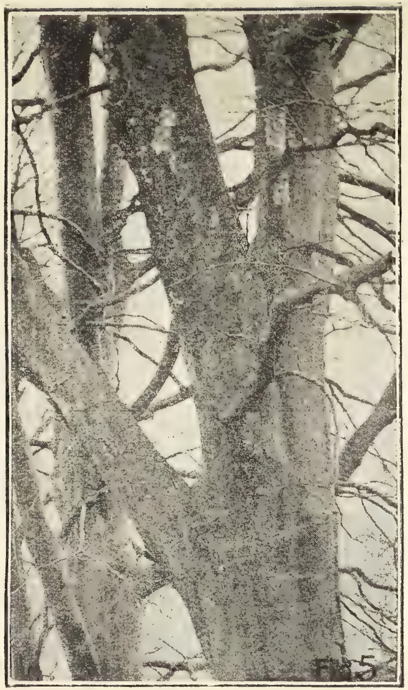


FIG. 5.—Upper branches of very old beech killed by the coccus. The bark has peeled off in patches. (Reduced.)

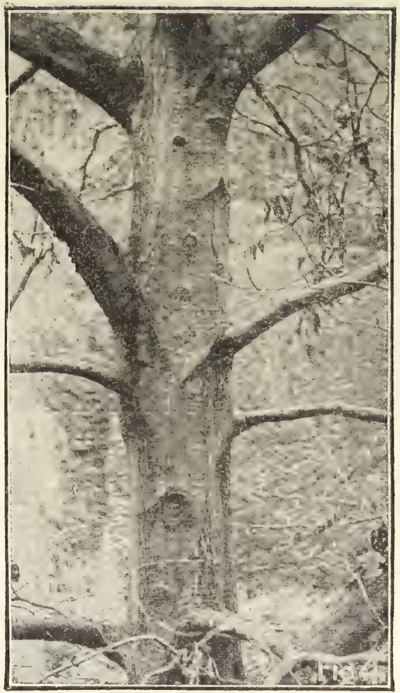


FIG. 4.—Showing young beech, which was similarly infected to that shown in Fig. 3, 21 months after treatment with insecticide. Now free from the pest. (Reduced.)

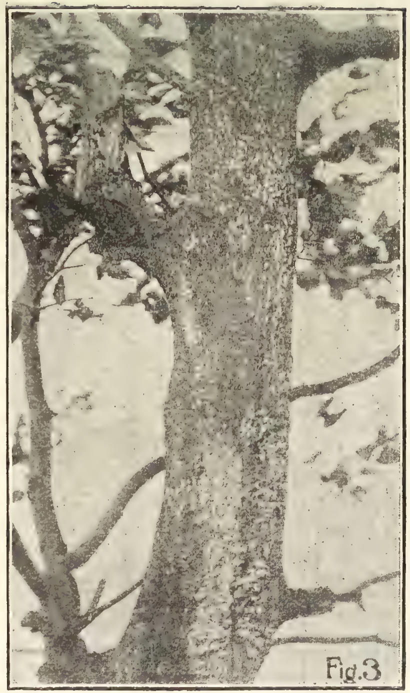


FIG. 3.—Main trunk of young beech badly infected with beech coccus. (Reduced.)

together, then add $\frac{3}{4}$ lb. of soft soap, stir well and add sufficient water to make up to ten gallons. CAUTION.—Do not mix in painted vessels of any kind.

Formulas Nos. 1 and 2 should be applied with a good stiff scrubbing-brush, one having the bristles also set at the end will be found the most serviceable, taking care to scrub the mixture well into the crevices and bifurcations of the branches and to break up the white coverings of the insects as much as possible. For a thoroughly satisfactory result from the use of the formula No. 2, see Fig. 4. In April 1903, over one hundred trees on an estate in Cheshire were treated with this mixture, and they are now (1905), with one or two exceptions, quite free from the pest. Two boys were employed to apply the dressing, under the careful supervision of a responsible person. In cases where the insects reappear, a local application is all that will be found necessary. Both Nos. 1 and 2 may be applied at any time between September and the first week in April.

The caustic alkali formula is essentially a winter wash, but may also be applied in early spring. It is usually applied with a spray pump or syringe, and is particularly useful in treating the smaller branches of trees. Two or three sprayings at intervals of two or three days will be found necessary. This wash has a burning effect upon the hands of the operator, and care must be taken in employing it. Close-fitting rubber gloves may be worn to protect the hands; and a rubber washer or flange, about 2 in. wide, should be fitted to the tube of the sprayer or syringe to prevent the wash running down the apparatus to the hands of the operator.

R. NEWSTEAD.

Committee on Fertilisers and Feeding Stuffs Act.

The Committee appointed by the Board of Agriculture to enquire into the working in Great Britain of the Fertilisers and Feeding Stuffs Act, 1893, and to report whether any, and, if so, what, further measures can, with advantage, be taken for the better protection of vendors and purchasers of the articles to which this Act applies, have now concluded their investigations and presented their report.*

* *Cd.* 2372. *Price* 4½*d.*

The first portion of the report gives the views of the Committee mainly with regard to failures in the administration of the Act, and the change in general policy which appears to be rendered necessary. It also indicates the procedure which should be adopted, as regards certain of the more important deficiencies in the safeguards to either purchaser or seller, in those cases where the existing procedure appears to require alteration. Stated briefly, the Committee hold that the methods for detecting fraud provided by the Act of 1893 have, although bettering the position of the less instructed agriculturists, failed to confer adequate protection upon them ; and that a change in administrative procedure is required. They propose, therefore, to throw the work of detecting fraud, in the main, upon the local authority (under the control of the Board of Agriculture), while affording to the individual farmer every possible facility for instructing himself as to the composition of fertilisers, as well as of feeding stuffs. They propose also that the onus of discriminating between culpable and unavoidable variations from the guarantee, hitherto left to the seller by requiring from him a statement of the minimum constituents, should be placed upon the District Agricultural Analysts. With the safeguards suggested, the seller may, it is considered, without undue risk or liability for error, give the buyer a statement of the actual constituents (within reasonable limits) of fertilisers and feeding stuffs. This should satisfy the reasonable requirements of the purchaser. Finally, the Committee propose that where there is not apparent fraud or culpable carelessness no criminal proceedings should be instituted.

Diagrams of Diseases of Forest Trees.

With a view to the dissemination of information as to fungus pests of forest trees, the Board of Agriculture have issued a series of coloured diagrams, prepared under the direction of the Director of the Royal Botanic Gardens, Kew, portraying some of the commoner diseases attacking trees in this country.

The diagrams comprise nine sheets, and may be obtained either directly or through any bookseller, from Messrs. Wyman &

Sons, Limited, Fetter Lane, London, E.C.; Messrs. Oliver & Boyd, Edinburgh; or E. Ponsonby, 119, Grafton Street, Dublin; price 1s. each sheet, or by post 1s. 3d., or the set, post free, for 9s. 5d. Each diagram is accompanied by a brief account of the diseases, together with a statement of the measures to be taken for their prevention or eradication, printed in large type, in the form of a wall-sheet. This description is also contained in a small handbook, which can be obtained separately, price 3d.

The diagrams include the following diseases:—No. 1, Coral-Spot Disease; Plane Leaf-Scorch; Apple Tree Canker; and Golden Tree-Agaric. No. 2, Pine Trametes; Apple Heart-wood Rot; Scaly Tree-Polyporus; Common Hairy Stereum; and False Tinder Fungus. No. 3, Conifer Cluster-Cups. No. 4, Collar Rot; Birch Polyporus; Conifer Root-Rot; Tinder Fungus; and Slimy Tree-Agaric. No. 5, Heart-wood Rot; Birch Polyporus; Dry Rot; and Wet Wood-Rot. No. 6, Peach Leaf-Curl; Apple Tree Mildew; Pear Leaf Cluster-Cups; and Sycamore Leaf-Blotch. No. 7, Larch canker; Conifer Rust. No. 8, "Witches' Brooms" of Silver Fir. No. 9, Conifer Seedling Blight; Spruce Canker; Pine Branch Twist; Seedling Mildew; and Osier Rust.

Manurial Experiments by Farmers.

The advantage to the farmer of testing by actual experiment the manurial requirements of his own fields is now generally recognised. It is, however, essential that the work undertaken should be on right lines so that definite information may be obtained. It is also highly desirable that the scheme adopted should bear a close relationship to that followed by other experimenters, for only in this way can corroborative information be obtained. A scheme of manurial and other agricultural experiments is published by the Board, and this will be found of considerable assistance to farmers wishing to experiment in the manner suggested. A copy will be forwarded on application.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of February, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 8	7 4	36 5	33 8
Herefords	7 8	7 0	—	—
Shorthorns	7 6	7 0	35 6	33 1
Devons	7 9	7 2	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8½	7½	9	7½
Sheep :—				
Downs	9	8¼	8¾	7¾
Longwools	8¾	7¾	8½	7½
Cheviots	9¼	8½	9	8
Blackfaced	9	8¼	8½	7½
Cross-breds	8¾	8	9	8¼
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 1	5 8	6 0	5 4
Porkers	6 8	6 3	6 10	6 0
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	20 6	17 8	20 16	16 18
,, —Calvers ...	19 16	16 14	18 17	16 0
Other breeds—In Milk ...	18 14	15 7	19 18	15 19
,, —Calvers ...	—	14 1	19 2	15 6
Calves for Rearing	2 3	1 13	2 8	1 13
Store Cattle :—				
Shorthorns—Yearlings ...	9 4	7 13	9 16	7 18
,, Two-year-olds	12 12	10 17	14 11	12 13
,, Three-year-olds	15 6	13 18	16 4	15 15
Polled Scots—Two-year-olds	—	—	16 2	13 8
Herefords— ,,	15 12	12 18	—	—
Devons— ,,	12 17	11 0	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs and Lambs—				
Downs or Longwools ...	44 9	40 4	—	—
Scotch Cross-breds ...	—	—	35 10	32 1
Store Pigs :—				
Under 4 months	25 2	18 11	22 10	16 9

* Estimated carcase weight.
† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of February, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	Quality.	London.	Birmingham.	Manchester.	Liverpool.	Glasgow.	Edinburgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	51 4	49 0	49 0	50 2	53 8*	51 4*
	2nd	49 0	44 4	44 4	44 4	46 8*	47 10*
Cow and Bull ...	1st	—	40 10	42 0	42 0	42 0	37 4
	2nd	—	33 10	37 4	35 0	37 4	32 8
U.S.A. and Canadian :—							
Birkenhead killed	1st	49 0	46 8	44 4	47 10	—	44 4
	2nd	43 2	40 10	39 8	42 0	44 4	39 8
Argentine Frozen—							
Hind Quarters ...	1st	28 0	26 10	26 10	29 2	29 2	32 8
Fore ,, ...	1st	23 4	24 6	22 2	24 6	26 10	30 4
Argentine Chilled—							
Hind Quarters ..	1st	37 4	38 6	35 0	40 10	—	39 8
Fore ,, ...	1st	28 0	28 0	25 8	28 0	—	28 0
American Chilled—							
Hind Quarters ...	1st	47 10	49 0	47 10	51 4	50 2	49 0
Fore ,, ...	1st	30 4	32 8	32 8	32 8	33 10	33 10
VEAL :—							
British	1st	73 6	68 10	72 4	70 0	—	—
	2nd	60 8	56 0	64 2	63 0	—	—
Foreign	1st	73 6	—	60 8	63 0	—	65 4
MUTTON :—							
Scotch	1st	68 10	—	77 0	75 10	72 4	68 10
	2nd	61 10	—	66 6	65 4	58 4	56 0
English	1st	64 2	67 8	70 0	71 2	—	—
	2nd	57 2	51 4	63 0	63 0	—	—
U.S.A. and Canadian—							
Birkenhead killed ...	1st	—	59 6	66 6	64 2	56 0	—
Argentine Frozen ...	1st	32 8	33 10	31 6	33 10	35 0	35 0
Australian ,, ...	1st	28 0	30 4	28 0	31 6	39 8	—
New Zealand ,, ...	1st	42 0	39 8	45 6	42 0	39 8	—
LAMB :—							
British	1st	101 6	101 6	—	—	—	—
	2nd	87 6	84 0	—	—	—	—
New Zealand ...	1st	61 10	—	63 0	61 10	50 2	—
Australian	1st	47 10	51 4	44 4	47 10	51 4	51 4
Argentine	1st	46 8	45 6	43 2	45 6	—	46 8
PORK :—							
British	1st	57 2	58 4	58 4	56 0	50 2	52 6
	2nd	47 10	50 2	52 6	45 6	47 10	44 4
Foreign	1st	54 10	47 10	46 8	50 2	—	44 4

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each of the under-mentioned Weeks in 1905, and in the corresponding Weeks in 1904 and 1903.

Weeks ended (*in* 1905).	Wheat.			Barley.			Oats.		
	1903.	1904.	1905.	1903.	1904.	1905.	1903.	1904.	1905.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Jan. 7 ...	24 11	26 6	30 4	24 1	22 6	24 4	17 0	15 7	16 3
,, 14 ...	24 11	26 11	30 4	24 1	22 3	24 6	16 10	15 9	16 3
,, 21 ...	25 0	27 3	30 5	24 1	22 4	25 0	16 11	15 11	16 5
,, 28 ...	25 4	26 11	30 6	24 3	22 3	25 1	17 0	15 8	16 7
Feb. 4 ...	25 6	26 9	30 6	23 9	22 4	25 0	16 11	15 11	16 7
,, 11 ...	25 6	26 8	30 7	23 7	22 2	25 2	17 1	15 9	16 8
,, 18 ...	25 4	26 11	30 5	23 4	22 7	25 2	17 1	16 0	16 9
,, 25 ...	25 3	27 10	30 10	23 2	22 4	25 0	17 1	16 3	16 10
Mar. 4 ...	25 3	28 8	30 8	23 1	22 6	25 2	17 1	16 5	16 10
,, 11 ...	25 1	29 1		22 10	22 5		17 0	16 8	
,, 18 ...	25 1	28 6		22 9	22 9		16 10	16 7	
,, 25 ...	25 2	28 2		22 4	22 8		17 0	16 7	
Apl. 1 ...	25 3	27 11		22 6	22 10		17 0	16 6	
,, 8 ...	25 4	27 10		21 10	22 5		17 2	16 5	
,, 15 ...	25 6	27 9		21 6	22 6		17 3	16 4	
,, 22 ...	26 1	27 9		21 9	22 0		17 9	16 4	
,, 29 ...	26 10	27 8		22 1	21 1		18 0	16 3	
May 6 ..	27 6	27 4		21 10	20 8		18 2	16 7	
,, 13 ...	27 9	27 1		22 5	19 10		18 4	16 6	
,, 20 ...	27 10	26 9		23 7	20 4		18 5	16 7	
,, 27 ...	27 8	26 9		23 7	19 8		18 5	16 7	
June 3 ...	27 6	26 10		23 10	18 8		18 4	16 8	
,, 10 ...	27 8	26 6		21 5	18 5		18 7	16 10	
,, 17 ...	27 6	26 5		20 7	18 2		18 3	16 8	
,, 24 ...	27 6	26 5		22 0	19 2		18 6	16 10	
July 1 ...	27 9	26 4		20 7	18 8		18 6	17 1	
,, 8 ...	28 1	26 6		19 11	19 8		18 3	17 1	
,, 15 ...	28 3	26 10		20 5	18 9		18 7	17 6	
,, 22 ...	28 7	27 7		20 10	18 10		18 5	17 6	
,, 29 ...	28 11	28 0		21 0	19 9		18 6	17 10	
Aug. 5 ...	29 3	28 3		20 1	19 9		18 8	17 10	
,, 12 ...	29 11	28 4		21 3	19 9		18 10	17 7	
,, 19 ...	29 9	28 8		20 4	22 5		18 6	16 7	
,, 26 ...	30 0	29 5		22 3	23 2		18 7	16 5	
Sept. 2 ...	30 3	30 2		22 5	25 3		18 5	16 3	
,, 9 ...	28 6	30 0		22 4	24 10		17 0	16 1	
,, 16 ...	27 5	29 7		24 2	24 9		16 4	15 11	
,, 23 ...	27 0	29 10		24 0	25 10		16 2	15 9	
,, 30 ...	26 3	29 10		23 9	25 5		15 9	15 8	
Oct. 7 ...	25 10	30 2		23 8	25 6		15 6	15 9	
,, 14 ...	25 8	30 5		23 9	25 4		15 5	15 8	
,, 21 ...	25 10	30 4		23 7	25 5		15 8	15 11	
,, 28 ...	26 0	30 6		24 2	24 11		15 8	15 10	
Nov. 4 ...	26 4	30 6		24 3	25 0		15 9	16 0	
,, 11 ...	26 6	30 3		24 6	24 6		15 9	15 11	
,, 18 ...	26 9	30 2		24 3	24 5		15 10	16 0	
,, 25 ...	26 6	30 5		23 11	24 4		15 11	16 1	
Dec. 2 ...	26 8	30 4		23 9	24 6		15 9	16 2	
,, 9 ...	26 7	30 4		23 2	24 4		15 9	16 2	
,, 16 ...	26 9	30 4		23 0	24 4		15 7	16 2	
,, 23 ...	26 5	30 3		22 5	24 7		15 6	16 1	
,, 30 ...	26 3	30 4		22 1	24 8		15 5	16 2	

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

—		Wheat.		Barley.		Oats.	
		1904.	1905.	1904.	1905.	1904.	1905.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	January ...	35 10	39 11	22 4	23 7	16 9	18 5
	February ...	35 10	39 11	22 5	23 8	16 9	18 10
Paris:	January ...	35 9	40 7	22 2	24 0	17 0	19 4
	February ...	35 9	40 3	22 2	24 4	17 4	19 9
Belgium:	January ...	28 2	30 7	21 5	23 6	15 9	20 1
		1903.	1904.	1903.	1904.	1903.	1904.
Berlin:	November ...	34 9	38 6	—	—	18 7	20 0
	December ...	35 6	38 11	—	—	18 4	19 7
Breslau:	November ...	33 8	36 6	23 2	25 7	16 7	18 6
	December ...	33 11	36 3	23 2	25 7	16 4	18 10

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets.*

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of February, 1904 and 1905.

—	Wheat.		Barley.		Oats.	
	1904.	1905.	1904.	1905.	1904.	1905.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	27 10	31 7	21 3	24 6	16 6	17 9
Norwich	27 7	30 6	21 4	24 10	14 11	16 6
Peterborough ...	25 11	29 11	20 8	24 6	15 1	16 4
Lincoln	26 4	29 10	23 0	23 10	15 7	15 11
Doncaster	25 11	29 5	22 9	24 1	15 9	15 9
Salisbury	26 5	30 0	21 6	25 11	16 1	16 6

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of February, 1905.

(*Compiled from Reports received from the Board's Market Reporters.*)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British	14 6	12 6	—	—	—	—	14 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	98 0	95 6	—	—	—	—	—	—
Danish ...	110 0	108 0	113 0	109 0	111 6	108 6	110 6	109 0
Russian ...	100 0	96 6	108 0	105 6	—	—	—	—
Australian ...	102 0	100 0	104 0	102 6	102 6	100 0	104 6	—
New Zealand...	103 0	102 0	105 6	103 6	104 6	102 6	106 0	—
CHEESE :—								
British, Cheddar	72 0	61 0	—	—	68 0	62 0	59 0	54 6
			120 lb.	120 lb.	120 lb.	120 lb.		
,, Cheshire	—	—	73 0	64 0	74 0	65 0	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	53 6	52 0	54 6	52 6	52 6	51 0	53 6	51 6
BACON :—								
Irish	62 0	56 6	59 6	57 0	58 6	53 6	60 6	57 6
Canadian ...	49 6	46 6	47 0	42 6	47 6	43 6	47 6	44 6
HAMS :—								
Cumberland ...	96 0	80 0	—	—	—	—	—	—
Irish	85 0	71 0	—	—	—	—	82 0	72 0
American (long cut) ...	45 0	42 6	44 6	40 6	44 0	40 6	44 6	42 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ...	11 10	10 3	—	—	—	—	—	—
Irish	11 3	9 6	10 7	10 0	10 7	10 1	12 1	9 8
Danish ...	11 9	10 4	10 9	9 3	—	—	10 8	9 11
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Blackland ...	56 0	50 0	44 6	38 6	45 0	40 0	—	—
British Queen	65 0	57 6	—	—	—	—	—	—
Up-to-Date ...	66 6	59 6	69 0	53 6	45 0	36 6	52 6	43 6
HAY :—								
Clover... ...	85 0	74 0	82 6	69 0	82 0	67 6	70 0	65 0
Meadow ...	74 0	62 0	65 0	59 0	57 6	45 0	67 6	61 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(*From the Returns of the Board of Agriculture and Fisheries.*)

DISEASE.	FEBRUARY.		2 MONTHS ENDED FEBRUARY.	
	1905.	1904.	1905.	1904.
Swine-Fever :—				
Outbreaks	40	88	87	210
Swine Slaughtered as diseased or exposed to infection ...	171	508	341	1,222
Anthrax :—				
Outbreak	78	81	160	164
Animals attacked	105	120	270	226
Glanders (including Farcy) :—				
Outbreaks	82	112	178	214
Animals attacked	156	228	328	447
Sheep-Scab :—				
Outbreaks	199	342	408	754

IRELAND.

(*From the Returns of the Department of Agriculture and Technical Instruction for Ireland.*)

DISEASE.	FEBRUARY.		2 MONTHS ENDED FEBRUARY.	
	1905.	1904.	1905.	1904.
Swine-Fever :—				
Outbreaks	1	9	4	18
Swine Slaughtered as diseased or exposed to infection ...	169	192	187	429
Anthrax :—				
Outbreaks	—	—	—	—
Animals attacked	—	—	—	—
Glanders (including Farcy) :—				
Outbreaks	4	1	6	2
Animals attacked	8	8	12	9
Rabies (number of cases) :—				
Dogs	—	—	—	—
Sheep-Scab :—				
Outbreaks	71	115	146	224

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